

ir. Hannes Cosyns

*Ricinodendron heudelotii* kernel group  
commercialization and its impact on farmers'  
livelihoods in Cameroon

Thesis submitted in fulfilment of the requirements for the degree of Doctor  
(PhD) in Applied Biological Sciences: Land and Forest Management





*Imagination is more important than knowledge.  
For knowledge is limited to all we now know and understand,  
while imagination embraces the entire world,  
and all there ever will be to know and understand.*

Albert Einstein

Ce livre est dédié à la mémoire de papa Placide Owoundi. Un gran homme avec un cœur plein de joie et d'amour. Que son âme repose en paix parmi ses ancêtres.

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# List of abbreviations

<b>ADEAC</b>	Association for the Development of Farm Workers of the Centre
<b>AFTP</b>	AgroForestry Tree Product
<b>AFTP4A</b>	AgroForestry Tree Products for West/Central Africa
<b>BA</b>	Beneficiary Assessment
<b>BSP</b>	Biodiversity Support Program
<b>CGIAR</b>	Consultative Group on International Agricultural Research
<b>CIA</b>	Central Intelligence Agency
<b>CARE</b>	Cooperative for Assistance and Relief Everywhere
<b>CBA</b>	Cost-Benefit Analysis
<b>CBFP</b>	Congo Basin Forest Partnership
<b>CGD</b>	Center for Global Development
<b>CFA</b>	Communauté Financière Africaine
<b>CIDA</b>	Canadian International Development Agency
<b>CIFOR</b>	Center for International Forestry Research
<b>CIG</b>	Common Initiative Groups
<b>DAC</b>	Development Agency Committee
<b>DANIDA</b>	Denmark's Development Cooperation Agency
<b>DFID</b>	Department for International Development
<b>DGDC</b>	Belgian Development Cooperation
<b>DREAM</b>	Dynamic Research Evaluation for Management
<b>E and QE designs</b>	Experimental and Quasi-Experimental designs

<b>ECBA</b>	Extended Cost-Benefit Analysis
<b>EIA</b>	Environmental Impact Assessment
<b>EpIA</b>	Ex post Impact Assessment
<b>ES</b>	Economic Surplus
<b>FAO</b>	Food and Agriculture Organisation of the United Nations
<b>FCFA</b>	Franc Communauté Financière Africaine
<b>FED</b>	Farmer Enterprise Development
<b>GA</b>	Gender Analysis
<b>GDP</b>	Gross Domestic Product
<b>GIS</b>	Geographic Information Systems
<b>GNI</b>	Gross National Income
<b>HDI</b>	Human Development Index
<b>HIV</b>	Human Immunodeficiency Virus
<b>IA</b>	Impact Assessment
<b>ICCO</b>	International Cocoa Organization
<b>IE</b>	Impact Evaluation
<b>IEG</b>	Independent Evaluation Group
<b>ICRAF</b>	World Agroforestry Centre
<b>ICRAF-AHT</b>	World Agroforestry Centre - African Humid Tropics
<b>IDRC</b>	International Development Research Centre
<b>IUCN</b>	International Union for the Conservation of Nature
<b>ILAC</b>	Institutional Learning And Change
<b>LFA</b>	Logical Framework Analysis
<b>MA</b>	statistical Meta-Analysis
<b>MCBA</b>	Meta-Cost-Benefit Analysis
<b>NGO</b>	Non-Governmental Organization
<b>NTFP</b>	Non-Timber Forest Product
<b>ODI</b>	Overseas Development Institute
<b>OECD</b>	Organisation for Economic Co-operation and Development

<b>PAR</b>	Participatory Action Research
<b>POPIN</b>	United Nations Population Information Network
<b>PPA</b>	Participatory Poverty Assessment
<b>PPP</b>	Purchasing Power Parity
<b>PRA</b>	Participatory Rural Appraisal
<b>PROTA</b>	Plant Resources of Tropical Africa
<b>RRA</b>	Rapid Rural Appraisal
<b>RWE</b>	Real World Evaluation
<b>SCBA</b>	Social Cost-Benefit Analysis
<b>SD</b>	Standard Deviation
<b>SEA</b>	Strategic Environmental Assessment
<b>SIA</b>	Social Impact Assessment
<b>SLA</b>	Sustainable Livelihoods Approach
<b>SLF</b>	Sustainable Livelihoods Framework
<b>SPSS</b>	Statistical Package for the Social Sciences
<b>UNCED</b>	United Nations Conference on Environment and Development
<b>UNDP</b>	United Nations Development Programme
<b>UNICEF</b>	United Nations Children's Fund
<b>USD</b>	United States Dollar
<b>ZOPP</b>	Zielorientierte ProjektPlanung



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# Summary

Current global economic upheavals have countries in the western world preoccupied with economic restructurings, credit ratings, government debts and unemployment rates (OECD, 2012b). Among these countries are many of the traditional development aid donor countries. As a consequence of the global financial crisis, their respective governments have to drastically reduce state expenditures. This has led to reopening the discussion on fund allocation to international development aid and whether this type of aid is useful or not (van der Laan, 2012). Moreover, in 2011, total official development aid went down for the first time in more than 10 years (OECD, 2012a). Some donor countries such as the Netherlands are even considering to stop their annual contribution entirely in the near future (van der Laan, 2012).

International development aid has come a long way since the first large program, the Marshall plan, was launched in 1948 in the context of rebuilding Europe during the post-World War II period. Over the years, methods and concepts on how to reduce the gap between more developed and less developed countries have been evolving to become more efficient and effective. However, evidence on overall impact of development projects and programs is still lacking (de Janvry et al., 2010; Riddell et al., 1997). Assessing the multiple impacts of development interventions such as socio-economic and financial impacts, is crucial, not only to provide donors with information to make well-reasoned decisions about future fund allocations, but also to increase the understanding of what works in development and what doesn't (van Rijn et al., 2012b; Leeuw and Vaessen, 2009).

It is against this background that the present thesis investigates the impacts of a research-development project on farmer livelihoods in Cameroon. The main objective is to assess the large variety of impacts of the project interventions on the households involved. In addition, we aim to increase the knowledge on participatory approaches for impact assessment studies and their reliability. In particular, we compare the impact of the development

project studied on farmer livelihoods as perceived by different stakeholders: target farmers, development organization staff and researchers.

The development project studied is called '*Increasing small-scale farmer benefits from agroforestry tree products in West and Central Africa (AFTP4A)*'. The project was funded by the Belgian Development Cooperation (DGDC) and implemented by the World Agroforestry Centre (ICRAF) and partners from Jan 2009 - Dec 2012. In some of the villages studied, the AFTP4A project was preceded by the '*Farmer Enterprise Development (FED)*' project which was also funded by DGDC and ran over 2003-2007.

In our study region, which is located in the Nyong-et-Mfoumou department in Cameroon, the project's activities consisted of promoting *Ricinodendron heudelotii* (Baill.) Pierre ex Pax' domestication and the commercialization of its kernels.

According to farmers *R. heudelotii* kernels, locally known as njansang, are one of the most important non-timber forest products (NTFPs) in the humid forest zone of Cameroon (Mollet et al., 1995; Tchoundjeu and Atangana, 2006). Just as many other NTFPs throughout the world, njansang contributes to farmers' diets but can also provide them with a cash income to cope with their daily needs (Ayuk et al., 1999). In Cameroon, the product is traded on local, national and regional markets (Manirakiza, 2007; Ndoye et al., 1997). *R. heudelotii* kernels are used for consumption. After crushing they are added as a flavouring agent in soups and food dishes (Plenderleith, 2006).

Commercialization of njansang and other NTFPs is thought to have the possibility to contribute to poverty alleviation while at the same time conserving the natural systems in which these NTFPs occur (Kusters et al., 2006). Therefore, NTFP commercialization has been promoted in many forest areas by national and international non-governmental and governmental organizations (Neumann and Hirsch, 2000). However, successfully intervening in the NTFP value chains has proven to be more challenging than expected (Belcher and Schreckenberg, 2007). It requires a long-term and multidisciplinary approach that ranges from providing support to both the technical and social aspects of natural resource management to understanding how markets function from local to international level (Belcher and Schreckenberg, 2007).

Multiple studies have shown that increasing NTFP commercialization can easily have negative impacts, such as, overexploitation and even local extinction of the species concerned (Hanson, 1992; Clay, 1997; Thomas

et al., 2011) as well as increased social conflicts and gender inequality (Neumann and Hirsch, 2000).

In Cameroon, the growing demand of *R. heudelotii* kernels is a serious challenge for research and policy institutions (Tieguhong et al., 2009). The latter authors states that policy institutions should formulate proper policies and allocate sufficient funds to support the creation of economically profitable, and environmentally and socially sustainable NTFP chains. Research institutions could provide objective and scientifically sound information to support the decisions of policy makers. In addition, concerns about overharvesting and long-term sustainability of NTFPs in general and njansang in particular have also been raised in Cameroon (Brown and Lassoie, 2010; Tieguhong and Ndoye, 2006; Plenderleith, 2006). However, very little reliable, quantified information is available on this issue.

Our methodological approach relied on the comparison of households in project villages in which ICRAF and partners had been promoting njansang commercialization with households in control villages where no such intervention occurred. Changes on farmer livelihoods were studied using the sustainable livelihoods framework (DFID, 1999). This implied that financial, natural, social, human and physical assets of farmer households were assessed. We observed the changes that have occurred over the 2005-2010 period using retrospective methods (Campbell and Luckert, 2002; Omilola, 2009). For data collection, we combined semi-structured household questionnaires, focus group discussions, interviews with key informants, wealth ranking exercises, participatory tree inventories and periodic (weekly) structured questionnaires.

Our results show that promotion of njansang commercialization by ICRAF and partners mainly had positive impacts on farmers' livelihoods. From a **financial** point of view, farmers' income from njansang commercialization doubled over the 2005-2010 period in project households. In 2010, household income derived from this activity reached a median value of 73.3 USD per year. Increases of financial assets in project households were significantly higher than the ones observed in control households, where for example absolute income changes over the same period were 18% lower as compared to project households. In 2010, njansang's share as cash-generating activity accounted for  $\pm 20\%$  of households' total cash income. This is in contrast to the 2005 situation when this figure attained 12% in project households and 15% in controls.

However, we also evidenced a number challenges. First, njansang group sales as organized by ICRAF and partners were not able to fulfil their main goal which is to increase unit prices. Second, wealthier households had

higher financial profits from the promotion of njansang commercialization in comparison with poorer households, thereby increasing inequality within the village.

Households' **human assets** were only influenced to a limited degree by njansang commercialization over the 2005-2010 period. Health- and education-related indicators improved slightly both in project and control households over the period assessed. However, these changes were only weakly related to increased njansang incomes. The main changes induced were related to farmers' increased knowledge and skills as a result of the capacity building program provided by the development organization. In addition, farmers in project villages perceived much larger changes in their self-esteem and sense of autonomy as compared to these of control households.

Current rise in njansang incomes did not enable households to increase their **physical assets** significantly. Nevertheless, between 2005 and 2010 a gradual shift was observed from households using njansang incomes to fulfil primary, daily needs, to households investing incomes in less-pressing needs such as making small investments and adding to savings.

Another important aspect of the AFTP4A project approach was the reinforcement of household **social assets**. The creation of njansang producer groups gave rise to a social framework in which new relations were forged and existing ones reinforced. Capacity building sessions provided by the development organization strengthened social assets and coherence among villagers. Moreover, farmers perceived that social changes affected functioning of other groups within the village and even influenced some aspects at family level such as conflict management. Although impacts on social assets were mainly positive, a few households did suffer negative social impacts of projects' interventions, such as social exclusion.

The impact on households' **natural assets** was studied as well. Results show an increased pressure on *R. heudelotii* trees and their kernels in both project and control households. Between 2005 and 2010, farmers visited more trees for fruit collection whereas each tree was more frequently visited, collecting higher percentages of fallen fruits. During this period the number of trees visited increased with 50% in project households as compared to 16% in controls. However, current practices do not seem to jeopardize the short-term survival of *R. heudelotii* whereas indications of a sustainable long-term exploitation without a negative impact on tree numbers seem to be present.

Finally, we compared the researchers' view on the project's impacts with the perceptions of target farmers and development organization staff.

Researchers and target farmers had similar impressions of impacts that had occurred, while development organization staff presumably overestimated them. In addition, the methodology enabled us to detect differences in alignment between development organization staff and target farmers.

Based on the results obtained from these participatory approaches, an approach was developed to monitor and evaluate impacts on farmer livelihoods of aspects affecting these livelihoods. The proposed approach is simpler and quicker than traditional impact assessment studies. This approach basically relies on farmers who have to grade and score a number of qualitative indicators. In addition, if according to stakeholders involved some indicators should be studied more in depth, our approach proposed allows the incorporation of quantitative indicators which can be assessed using more rigorous methods. The methodology proposed is customizable, holistic and combines quick and simple data collection methods with thorough quantitative or qualitative research to assess impacts on farmers' livelihoods.

After evidencing the impacts of development interventions in this concrete project case, we discuss whether or not villages and households not receiving any project interventions could evolve over time in the same direction as project households and villages have. In this way, we are actually questioning the need of the development interventions. We state that the added value of the project interventions over the long-term are mainly related to the institutional changes, and the new skills and knowledge acquired by the farmers. The present study thus emphasizes the importance of capacity building, and increasing human and social capital. However, we do recognize, together with such authors as Collett and Gale (2009), that capacity building in itself will rarely have sustainable impacts if it is not combined with short-term benefits for farmers. Hence, regarding the concrete project case studied, the combination of capacity building with the positive impacts that the project had on the diverse assets of farmer livelihoods were the strength of this project.

Finally, we provide the major implications of our study's results and recommendations for further research where we emphasize the need for more studies on the use of participatory approaches in impact evaluation, as we think that this may become an important aspect of impact assessment in the future (Estrella et al., 2000). In addition, we provide recommendations to development organizations on some aspects of impact evaluation as well as pitfalls and opportunities.



# Samenvatting

De huidige wereldwijde economische omwentelingen houden landen in de westerse wereld in de ban van economische hervormingen, kredietwaardigheid, staatsschulden en werkloosheidscijfers (OECD, 2012b). Veel van deze landen zijn traditionele donorlanden van internationale ontwikkelingshulp. Momenteel, als gevolg van de economische crisis, moeten deze landen drastische besparingsmaatregelen nemen wat geleid heeft tot de heropening van de discussie over het nut van internationale ontwikkelingshulp en de respectievelijke budgetten die hiervoor vrijgemaakt worden (van der Laan, 2012). Zo is in 2011 de totale officiële ontwikkelingshulp voor het eerst sinds 10 jaar gedaald (OECD, 2012a). Daarbovenop overwegen sommige donorlanden, zoals Nederland, zelfs om hun jaarlijkse bijdrage volledig op te schorten in de nabije toekomst (van der Laan, 2012).

Hoewel er reeds vele ontwikkelingsprojecten en -programmas gefinancierd zijn, is er echter nog steeds een groot gebrek aan kennis over wat de impact hiervan nu juist is op de economische ontwikkeling van een land en de welvaart en het welzijn van zijn bevolking (de Janvry et al., 2010; Riddle et al., 1997). Het bestuderen van de impact van ontwikkelingshulp is van cruciaal belang, niet alleen om donoren en beleidsmakers te informeren en hen te helpen om beredeneerde beslissingen over het toewijzen van budgetten, maar ook om de kennis van wat werkt en wat niet in ontwikkelingsamenwerking te vergroten (van Rijn et al., 2012b; Leeuw en Vaessen, 2009).

Het is tegen deze achtergrond dat dit proefschrift de impact bestudeert van een onderzoek & ontwikkelingsproject op het levensonderhoud (*livelihoods*) van boeren in Kameroen. De hoofddoelstelling is om de verschillende effecten geïnduceerd door de projectinterventies op de betrokken huishoudens te bestuderen. Daarnaast wordt het gebruik van participatieve methoden in impactstudies bestudeerd, alsook de betrouwbaarheid van deze methoden. Hiervoor vergelijken we de impact van het ontwikkelingsproject op de boeren hun levensonderhoud zoals bestudeerd door de onderzoekers met

de percepties van de boeren als doelgroep en de ontwikkelingswerkers.

Het bestudeerde ontwikkelingsproject focusde op '*het verhogen van de inkomsten die kleinschalige boeren halen uit agroforestry producten in West- en Centraal-Afrika (AFTP4A)*'. Het project werd gefinancierd door de Belgische Ontwikkelingssamenwerking (DGOS) en de praktische uitvoering ervan was in handen van het World Agroforestry Centre (ICRAF) en partners (januari 2009-december 2012). In sommige van de onderzochte dorpen werd het AFTP4A project voorafgegaan door een ander project van ICRAF dat focuste op de '*ontwikkeling van boerenorganisaties (FED)*' en dat eveneens werd gefinancierd door DGOS (2003-2007).

In ons studiegebied, dat zich situeert in het departement Nyong-et-Mfoumou in Kameroen, bestond het onderzochte ontwikkelingsproject uit het bevorderen van *Ricinodendron heudelotii* (Baill.) Pierre ex Pax domesticatie en de commercialisering van deze boom zijn noten. De boeren in de regio identificeerden *R. heudelotii* noten, plaatselijk bekend als njansang, als één van de belangrijkste niet-houtige bosproducten (NTFPs) in de vochtige bossen van Kameroen (Mollet et al., 1995; Tchoundjeu and Atangana, 2006). Net als vele andere NTFPs over de hele wereld, wordt njansang geconsumeerd door de boeren, daarnaast kan het ook vermarkt worden en zo zorgen voor een extra inkomen (Ayuk et al., 1999). *R. heudelotii* noten worden, na pletten, toegevoegd als een smaak- en bindmiddel in soepen en andere gerechten (Plenderleith, 2006). Het product wordt verhandeld op lokale, nationale en internationale markten (Manirakiza, 2007; Ndoye et al., 1997).

Eén van de onderstelde sterke punten van NTFP commercialisatie is dat de verkoop van deze producten de armoede kan helpen bestrijden terwijl het ook de bescherming van de natuurlijke systemen waarin de NTFPs voorkomen stimuleert (Kusters et al., 2006). Daarom is de commercialisatie van NTFPs financieel ondersteund en gepromoot geweest in talrijke bosgebieden over de hele wereld door nationale en internationale niet-gouvernementele en gouvernementele organisaties (Neumann and Hirsh, 2000). Nochtans is gebleken dat het tussenkomen in de waardeketen van NTFPs niet vanzelfsprekend is en heel wat moeilijkheden en onzekerheden met zich meebrengt (Belcher en Schreckenberg, 2007). Er wordt ondersteld dat dergelijke interventies een langdurige en multidisciplinaire aanpak vereisen. Die aanpak gaat van het verstrekken van technische ondersteuning, en het bijstaan bij het beheer van de natuurlijke hulpbronnen, tot het in acht nemen van sociale en cultuurgebonden aspecten. Daarbovenop moet men inzicht hebben in het functioneren van de markten van lokaal tot op internationaal niveau (Belcher en Schreckenberg, 2007).



Verschillende studies hebben aangetoond dat de toename van NTFP commercialisatie gemakkelijk tot negatieve gevolgen kan leiden. Overexploitatie en zelfs lokaal uitsterven van de betreffende soort (Hanson, 1992; Clay, 1997; Thomas et al., 2011), of een toename van sociale conflicten en genderongelijkheid (Neumann and Hirsh, 2000) zijn hier enkele voorbeelden van.

In Kameroen is de groeiende vraag naar *R. heudelotii* noten een serieuze uitdaging voor onderzoeks- en beleidsinstellingen (Tieguhong et al., 2009). Beleidsinstellingen moeten de juiste beleidsmaatregelen formuleren en voldoende middelen beschikbaar maken om economisch rendabele NTFP ketens te ondersteunen die ook ecologisch en sociaal duurzaam zijn. Onderzoeksinstellingen kunnen innovaties testen en objectieve informatie verschaffen aan de beleidsmakers om deze te ondersteunen bij hun beslissingen. Daarnaast is er een mogelijk probleem van overexploitatie van de NTFPs en van de duurzaamheid van de waardeketen bij NTFP commercialisatie. Ook in Kameroen wordt de duurzaamheid van de NTFP waardeketens in het algemeen, en van njansang in het bijzonder, in vraag gesteld (Brown and Lassoie, 2010; Tieguhong and Ndoye, 2006; Plenderleith, 2006). Er is echter heel weinig gekwantificeerde informatie beschikbaar over dit onderwerp.

Onze methode in dit proefschrift bestond erin huishoudens in projectdorpen' waar ICRAF en partners njansang commercialisatie promoten te vergelijken met huishoudens in controledorpen waar geen dergelijke interventies plaatsvonden. We maakten gebruik van het Sustainable Livelihood Framework (DFID, 1999) om de veranderingen in de boeren hun levensonderhoud te bestuderen. Dit theoretisch kader houdt rekening met het financieel, natuurlijk, sociaal, menselijk en fysiek kapitaal van de boeren. De veranderingen van deze vijf types kapitaal, gedurende de periode 2005-2010, werden in deze studie onderzocht met behulp van retrospectieve methoden (Campbell and Luckert, 2002; Omilola, 2009). Voor de datacollectie werd gebruik gemaakt van semi-gestructureerde vragenlijsten voor de huishoudens, focusgroepen, interviews met key-informants, welvaartrankings van de huishoudens, participatieve boominventarisaties en periodieke (wekelijks) gestructureerde vragenlijsten.

Onze resultaten toonden aan dat de bevordering van njansang commercialisering door ICRAF en partners een positieve impact had op de boeren hun levensonderhoud. Vanuit een **financieel** oogpunt, waren huishoudens' inkomens uit njansang verdubbeld gedurende de periode 2005-2010. In 2010, bedroeg een huishouden's inkomen uit njansang commercialisering 73,3 US dollar per jaar (mediaan). Dit bedrag was, in 2010, 21% van hun totale jaarlijkse cash inkomen, terwijl dit in 2005

slechts 12% in project huishoudens en 15% in controle huishoudens was. Over de hele lijn stegen de financiële voordelen significant meer in project huishoudens dan in de controle groep. Zo was bijvoorbeeld de stijging van het absolute inkomen uit njansang commercialisering 18% hoger in project huishoudens dan in controle huishoudens.

Desalniettemin bleek uit de resultaten dat enkele punten voor verbetering vatbaar zijn. Ten eerste, waren er de ondermaatse resultaten van de groepsverkoppen voor njansang. Deze groepsverkoppen vormen de basis van ICRAF's systeem om de inkomens voor de boeren te verhogen. Maar de basisidee van deze verkoopstrategie, namelijk het verhogen van de prijs per eenheid njansang werd niet vervuld en de verkregen eenheidsprijzen lagen niet hoger dan deze van de individuele verkoop. Ten tweede, haalden de huishoudens die behoorden tot de groep met hoger welvaartstatus in het dorp meer financiële voordelen uit de toegenomen verkoop van njansang dan de armere huishoudens. Op die manier vergrootte njansang commercialisering de kloof tussen rijk en arm in de projectdorpen.

Huishoudens' **menselijk kapitaal** werd slechts in beperkte mate beïnvloed door de njansang commercialisering gedurende de periode 2005-2010. Indicatoren gerelateerd aan gezondheid en educatie verbeterden enigszins zowel in project- als in controledorpen, maar deze verbeteringen hadden volgens de boeren slechts weinig te maken met de verhoogde njansang inkomens. De grootste impact van de projectinterventies op het menselijk kapitaal had te maken met de verbeterde vaardigheden en kennis van boeren. Dit was het resultaat van het capaciteitsopbouw programma van de ontwikkelingsorganisatie zowel op vlak van njansang commercialisatie als op organisatorisch vlak in het algemeen. Daarnaast, bleek ook dat de boeren hun eigenwaarde en gevoel van autonomie in projectdorpen meer gestegen was dan in controledorpen.

De impact op het **fysiek kapitaal** was insignificant. De huidige stijging van het njansang inkomen liet huishoudens niet toe om grote investeringen te doen en nieuw materiaal aan te kopen. Er werd tussen 2005 en 2010 wel een geleidelijke verschuiving waargenomen waarbij huishoudens hun njansang inkomen minder gingen gebruiken om enkel aan hun primaire, dagelijkse behoeften te voldoen, maar ook om minder dringende behoeften te bevredigen, kleine investeringen te realiseren en te sparen.

Een ander belangrijk aspect van het AFTP4A project was de versterking van huishoudens' **sociaal kapitaal**. De oprichting van een njansang groep creëerde een sociaal kader waarin nieuwe relaties konden gevormd worden en bestaande relaties versterkt. Capaciteitsopbouw sessies speelden hierbij een zeer belangrijke rol en zorgden daarnaast ook voor een groter gevoel

van samenhangigheid tussen de boeren. Daarenboven, bemerkten boeren dat bepaalde aspecten van deze sociale capaciteitsopbouw een invloed hadden op het functioneren van ander organisaties in het dorp en zelf veranderingen teweeg brachten op het niveau van de familie, zoals in conflict management. Hoewel de meeste effecten van het project een positieve invloed hadden op een huishouden's sociaal kapitaal, bemerkten enkele huishoudens negatieve effecten zoals sociale uitsluiting en een verhoging van het aantal conflicten tussen huishoudens voornamelijk gerelateerd aan eigendom- en oogstrechten.

De impact op de huishoudens hun **natuurlijk kapitaal** werd ook bestudeerd en er werd aangetoond dat de druk op *R. heudelotii* bomen en hun noten zowel in project- en controlehuishoudens verhoogd was. Tussen 2005 en 2010 bezochten de boeren meer bomen om njansang te verzamelen en werd elke boom ook meer frequent bezocht en verzamelden ze er hogere percentages van de gevallen vruchten. Gedurende deze periode steeg het aantal bezochte bomen met 50% in project huishoudens terwijl dit slechts 16% was in controle huishoudens. Hoewel gemiddeld 70% van de gevallen vruchten verzameld werd door de boeren, leken de huidige praktijken geen negatief effect te hebben op de populaties van *R. heudelotii* op korte termijn. Er waren ook aanwijzingen dat ook op lange termijn de huidige manier van exploitatie geen negatieve invloeden zal hebben.

Tenslotte vergeleken we de resultaten van de onderzoekers over de impact van het project, met de percepties die de boeren en ontwikkelingswerkers hadden over deze impact. Onderzoekers en boeren vertoonden gelijkaardige resultaten over wat veranderd was en over de grootte van deze veranderingen. Ontwikkelingswerkers hadden daarentegen de impact van hun interventies overschat. Via de gebruikte methodologie kon ook de visies van de boeren en die van de ontwikkelingswerkers over succesvolle njansang commercialisatie vergeleken worden en de verschillen worden gekwantificeerd. De resultaten toonden aan dat ontwikkelingswerkers en boeren over het algemeen op dezelfde lijn zaten maar dat er enkele aspecten waren, zoals het belang van inkomstenverlies door vraat, waaraan meer aandacht kan besteed worden in de toekomst.

Gebaseerd op de resultaten van onze studie ontwikkelden we een nieuwe, eenvoudigere en snellere manier om de impact van uiteenlopende projecten op het levensonderhoud van boeren op te monitoren en te evalueren. De idee bestaat erin een aantal kwalitatieve indicatoren te selecteren en de boeren het relatief belang en de verandering in de tijd van deze indicatoren te laten evalueren. Daarnaast kan een subset van indicatoren geselecteerd worden die men meer in detail wenst te bestuderen en waarvoor meer grondige methodes gehanteerd worden. De voorgestelde methode is flexibel,

holistisch en combineert een snelle eenvoudige datacollectie methode met meer diepgaande kwantitatieve of kwalitatieve methodes om de impact van projecten op boeren hun levensonderhoud te bestuderen.

Nadat we de impact van het concrete ontwikkelingsproject uiteengezet hebben, bediscussiëren we of huishoudens en dorpen die geen externe hulp hebben ontvangen in dezelfde richting zouden evolueren als de huishoudens en dorpen die deze hulp wel ontvingen. We stellen dus het nut en de noodzaak van de bestudeerde ontwikkelingsinterventies in vraag. We concluderen dat de toegevoegde waarde van het ontwikkelingsproject op lange termijn ligt in het feit dat er institutionele veranderingen plaatsvonden en dat boeren nieuwe vaardigheden en kennis hebben verworven. Het belang van capaciteitsopbouw en het nut van sociaal en menselijk kapitaal wordt hierbij nogmaals benadrukt. Hoewel we ook onderkennen, net als andere auteurs zoals Collet en Gale (2009) dat capaciteitsopbouw op zich zelden een duurzame impact heeft als het niet gecombineerd wordt met (al dan niet financiële) voordelen op korte termijn. De sterkte van het bestudeerde project is net het feit er een combinatie was van positieve effecten op de verschillende aspecten van de boeren hun levensonderhoud.

Tot slot geven we de belangrijkste implicaties van onze studie en aanbevelingen voor verder onderzoek. Hierbij leggen we de nadruk op de noodzaak van meer onderzoek naar het gebruik van de participatieve methodes in impactevaluatie studies. We veronderstellen namelijk dat dit een belangrijk aspect van de impactevaluatie kan worden in de toekomst (Estrella et al., 2000). Daarnaast bieden wij aanbevelingen voor ontwikkelingsorganisaties i.v.m. een aantal aspecten van impact evaluatie, haar valkuilen en opportuniteiten.

# Chapter 1

## Introduction



## 1.1 General background

### Njansang as a non-timber forest product

Non-Timber Forest Products (NTFPs) have been collected by human populations for subsistence use and trade for thousands of years (Neumann and Hirsch, 2000). They have been shown to be of great importance for rural communities for guaranteeing their daily diet as well as being a potential source of cash income to cope with their daily needs (Pimentel et al., 1997; Marshall et al., 2006b). In developing countries, an estimated 80% of populations relies in one way or another on NTFPs for food, medicines, shelter, etc. (Bennett, 2002).

The importance of NTFPs has never been denied. However, the use of NTFPs for development and conservation purposes received a real boost following the study of Peters et al. (1989) in 'Nature', claiming that more money could be earned from tropical forests through NTFP commercialization than through logging. Next, during the Rio Convention in 1992 the importance of NTFP commercialization was reinforced. This strongly accelerated the development and use of NTFPs (Marshall et al., 2006b; Ahenkan and Boon, 2011). The strength of NTFP commercialization is that NTFPs are thought to have the capacity to alleviate poverty in combination while contributing to the conservation of the natural systems in which they occur (Kusters et al., 2006).

Within this framework, lots of projects have been supported by non-governmental, national and international organizations to promote the commercialization of NTFPs, with different degrees of success (Neumann and Hirsch, 2000). The Food and Agriculture Organization (FAO) of the United Nations, was one of the first agencies to promote NTFPs through its program on *non-wood forest products*. Over the past 20 years, other international agencies have incorporated the concept of NTFPs into their research and development programs. Among these there are the World Bank, Canadian International Development Agency (CIDA), International Development Research Centre (IDRC), Center for International Forestry Research (CIFOR), International Union for the Conservation of Nature (IUCN) and the Biodiversity Support Program (BSP) (Ahenkan and Boon, 2011).

The initial optimism with relation to NTFPs, as possible saviours of the tropical forests, has been tempered over the years (Sills et al., 2011). Intervening in NTFP commercialization has proven to be a very challenging task (Belcher and Schreckenber, 2007; Arnold and Ruiz Pérez, 2001). It requires a long-term and multidisciplinary approach that ranges from

providing support to both the technical and social aspects of natural resource management to understanding how markets function from local to international level (Belcher and Schreckenberg, 2007).

In the humid forest zone of Cameroon, the kernels from *Ricinodendron heudelotii* (Baill.) Pierre ex Pax. has been identified by farmers as one of the most important NTFPs from their area (Mollet et al., 1995; Plenderleith, 2004). The tree produces fruit from which gold-coloured kernels (njansang) are extracted and commercialized (Ayuk et al., 1999). Kernels are used as food. After crushing, they are added as a flavouring and thickening agent in soups, fish stews and other dishes (Tchoundjeu and Atangana, 2006; Plenderleith, 2004). Kernels, rich in proteins and polyunsaturated fats, have a high nutritional value (Tchoundjeu and Atangana, 2006). They are a source of proteins, a nutrient which is often deficient in the diet of farmers in tropical regions (Besong et al., 2011; Termote et al., 2010).

This NTFP is traded on the local, national and regional markets (Manirakiza, 2007; Ndoeye et al., 1997). As a consequence it provides cash income for many farmers in West and Central Africa (Plenderleith, 2006; Ayuk et al., 1999). Current trends show increasing njansang consumption figures in cities in West and Central Africa (Manirakiza, 2007), as well as increased export quantities to the diaspora, especially Europe (Plenderleith, 2004). The latter author also states that njansang has a promising market which is wider and more global than currently reached.

*Ricinodendron heudelotii* kernels have been subject of many studies. Their economic potential and nutritional value have been demonstrated by several authors (Leakey, 1999a; Plenderleith, 2006; Ayuk et al., 1999; Tiki Manga et al., 2000). Currently, product processing and quality differentiation are still very limited. However, a number of technical aspects of product processing are currently being developed which could largely expand njansang's market and increase the kernel's value in the near future (Mundi et al., 2012; Plenderleith, 2006). In addition, initial studies state that the properties of the oil extracted from the kernels is suitable for the production of cooking oil and margarine, or for manufacturing soaps and pharmaceutical preparations (Plenderleith, 2006).

## Impact of development aid

In 2011, global official development aid from members of the Development Agency Committee (DAC) attained 134 billion USD dollars (OECD, 2013b). That year, Cameroon received a share of 585 million USD dollars, mainly from France, its former colonial occupier. But which impact does this

financial input have on economic growth and people's livelihoods? Moreover, the question can be asked whether development interventions really work?

The debate on the usefulness or uselessness of development aid has always existed and the subject can still lead to sharp discussions between advocates and opponents (Schleifer, 2009; Dichter, 2003; Murphy and Tresp, 2006; Dalgaard and Tarp, 2002). The current economic recession in many of the traditional donor countries has only fuelled the debate. For the first time since 1997 official development aid has fallen with 2.7% in 2011 as compared to 2010 (disregarding years of exceptional debt relief) (OECD, 2012a). According to the latter source, the biggest relative falls in aid contributions were registered in Austria, Belgium, Greece, Japan and Spain. In addition, the Netherlands, which has always been exemplary when it comes to countries' relative contribution to global development aid, states that in the near future the budget for development aid will disappear entirely (van der Laan, 2012). To compensate, they state to help developing countries by increasing trade agreements (van der Laan, 2012). Next to this, studies show that developing countries will need extra assistance to mitigate the negative impacts of the global crisis (Massa et al., 2012).

The statement whether development aid contributes significantly to sustainable development of countries and regions, falls beyond the scope of this study. However, we do aim to make a contribution to the discussion on this complicated issue.

If sound statements are to be made about development interventions, and if we want future interventions to be improved, evidence is needed about the kind of outcomes induced by different development interventions. The latter can be provided by thoroughly assessing the impacts of development programs and projects. Currently, among donors and other stakeholders there is a strong demand to perform impact assessment studies. The reasons for this are multiple. There is an increased need for accountability towards funders, increased competition for funds between non-governmental organizations (NGOs), countries and other stakeholders, as well as the realization that measuring impact is crucial to increase the understanding of what works and what doesn't, and to make future interventions more effective and efficient (Leeuw and Vaessen, 2009; van Rijn et al., 2012b).

## **1.2 Problem statement**

### **Assessing impact of development projects**

In the conclusion of the 2006 report by the Center for Global Development (CGD) it is argued that despite the fact billions of US dollars have been



spent on development programs in developing countries, there is relatively little knowledge about the net impact of most of these projects and programs (Savedoff et al., 2006; de Janvry et al., 2010; Riddell et al., 1997; ODI, 1996; Kelly et al., 2004).

Development organizations understand that communicating on results and impacts is of great importance. However, lack of objectivity in applied methodologies and the neglect of rigorous data collection methods has generated a large amount of literature which does not necessarily contribute to our understanding of what works and what doesn't in development (Savedoff et al., 2006). This gap hampers the evolution towards more effective and efficient development initiatives (Savedoff et al., 2006; OECD, 2013a; Kelly et al., 2004). In addition, results of impact studies that have been carried out are poorly documented and communicated, causing the persistence of outmoded development approaches (Riddell et al., 1997; de Janvry et al., 2010).

Recently, literature related to measuring impact of rural development interventions, stresses the importance of using more rigorous methodologies based on experimental and quasi-experimental designs (de Janvry et al., 2010). In addition, the multi-dimensionality of many problems has been recognized, i.e. how for example incentives focusing on financial capital can influence social assets as well as other aspects of farmer livelihoods. It has also been suggested that studies should rely on both quantitative and qualitative data (Schreckenberget al., 2005). However, these recommendations remain mainly theoretical. In practice, such comprehensive and multi-dimensional impact assessments are rarely performed (Maredia, 2009).

Finally, there is also a trend to make impact evaluation more participatory (Estrella et al., 2000; Maredia, 2009; O Berg and Månsson, 2011). This because conventional evaluation approaches, relying on the expertise of outsiders for the sake of enhancing objectivity, have been widely discussed and criticized in literature (e.g. Green, 1994; Chambers, 1997; Zukoski and Lulaquisen, 2002). Major criticisms are related to high costs, ineffectiveness in terms of measuring what is important, failure to involve project beneficiaries, focusing too much on quantification and failure to integrate evaluation in the project cycle and learn from it. In contrast, participatory evaluation approaches aim to make monitoring and evaluation more responsive and appropriate to people's needs and real life contexts (Estrella et al., 2000). Currently, the use of participatory approaches for project monitoring and evaluation are the exception rather than the rule (Estrella et al., 2000; Bond and Pope, 2012). This is partly related to the uncertainty about the accuracy and reliability of participatory approaches (Bell et al.,

2012; Hacking and Guthrie, 2006; Holck, 2008; Guijt and Gaventa, 1998). If participatory approaches are to be included in impact analysis, there is still a lot to be learnt before large-scale dissemination can occur (Estrella et al., 2000).

To conclude, there is a lack of thorough, multi-dimensional impact assessment studies. The latter, however, are indispensable if future development interventions are to contribute to improving livelihoods and alleviating poverty.

## **Promoting NTFP commercialization**

Despite high interest in NTFP commercialization, comprehensive studies analysing the impacts of the promotion of NTFP commercialization on poverty reduction remain scarce. However, these studies could be of great importance for policy makers, NGOs and other institutions that focus on sustainable rural development. Based on well-performed impact studies, promotion of NTFPs could be more intensively supported, adjusted or, in some cases, even halted.

Promotion of NTFP commercialization, if properly executed, could greatly benefit farmer livelihoods (Tieguhong et al., 2009). Development institutions promoting NTFP activities could prevent and/or mitigate the negative impacts which are often associated with increased NTFP commercialization (Tieguhong et al., 2009). Among these negative impacts we can mention overexploitation, intrusion of outsiders, poverty traps, unwanted state interference, exclusion of vulnerable groups, etc. (Neumann and Hirsch, 2000). Where farmers lack the necessary insight in market functioning and the preconditions needed to successfully and sustainably commercialize NTFPs, development organizations could intervene. In addition, farmers participation can provide knowledge, express farmers' needs and increase their commitment and ownership of the NTFP commercialization process.

However, intervening in NTFP commercialisation is probably more challenging and complex than when one chooses to walk on other rural development activities (Belcher and Schreckenberg, 2007). This complexity is probably one of the reasons why well-performed impact studies on the promotion of NTFP commercialization are so rare.

Furthermore, impact studies in general, and of NTFP-centred initiatives in particular, usually tend to focus on economic aspects of farmers' livelihoods, i.e. changes in farmers' income (e.g. Tieguhong and Nkamgnia, 2012; Fu et al., 2009a; Kar and Jacobsen, 2012). They seem to neglect or minimize the impacts NTFP commercialization can have on other aspects of farmer

livelihoods such as social or natural assets. However, successful NTFP commercialization cannot be caught by a single variable. Solely focusing on the financial aspect is not sufficient and other aspects should be considered as well (Marshall et al., 2006b). According to Neumann and Hirsch (2000) and Belcher and Schreckenberg (2007), it is important to place NTFP commercialization in a broader context encompassing the multiple assets contributing to farmer livelihoods. In order to do this, the use of a multidimensional and interdisciplinary approach is needed (Marshall et al., 2006b; Belcher and Schreckenberg, 2007).

Framing of results in a broader context is also recommended in development circles, where it is advised to frame specific project outcomes in the larger context of people's livelihoods and activities (DFID, 1999; Maredia, 2009). This should provide a more meaningful assessment of the project's impact and could contribute to improve future interventions. Again, thorough impact studies that address this multi-dimensionality are lacking.

Next, many of the comprehensive works and current insights (Marshall et al., 2003, 2006b), as well as theoretical frameworks and models (Newton et al., 2006), are based on case studies from Latin America. To make more global statements, comprehensive studies from other continents should also be provided (Neumann and Hirsch, 2000). Specifically for Africa, there is an urge for good studies on NTFP commercialization in order to improve NTFP value chains but also in order to evaluate and improve local, national and international policies (Tieguhong et al., 2009).

Regarding *R. heudelotii* kernels, the growing demand for the kernels on local, national and regional markets is a serious challenge for research and policy institutions. Research results can support decision makers when allocating funds and formulating policies with the aim to create and improve sustainable NTFP value chains. In addition, more research is needed to improve product processing and tap the full potential of the product's derivatives (Tieguhong et al., 2009). Also, concerns about overharvesting and long-term sustainability of the product have been raised in Cameroon (Brown and Lassoie, 2010; Tieguhong and Ndoeye, 2006; Plenderleith, 2006). However, very little reliable quantified information is available on this issue. Brown and Lassoie (2010) mentioned that intense exploitation of njansang could lead to insufficient juvenile recruitment to sustain future tree populations to harvest from. In addition, they mentioned that tree domestication could help solving the tree regeneration problem. However, no concrete data are available to support these hypotheses. Similar observations were made by Sunderland and Tchouto (1999).

### 1.3 Thesis objectives

The **main objective** of this thesis is to:

**assess the impact of the promotion of *Ricinodendron heudelotii* kernel group commercialization on farmers' livelihoods in the humid forest zone of Cameroon.**

With 'promotion' we refer to the development projects of the World Agroforestry Centre (ICRAF) and partners in the region, which are encouraging and guiding farmers to increase their benefits from agroforestry tree products.

This objective can be subdivided in five specific objectives, following the sustainable livelihoods framework which was used to assess farmers' livelihoods (DFID, 1999). These include:

assessment the impact of the promotion of *Ricinodendron heudelotii* kernel group commercialization on farmers':

- financial assets;
- social assets;
- natural assets;
- physical assets; and
- human assets.

More detailed objectives for each asset group will be discussed in the respective chapters.

This thesis has also objectives pertaining to increase the knowledge of participatory approaches and their reliability. Participatory methods will be compared to more conventional methods.

The most important objective here is to:

**compare the impact of the development project studied on farmers' livelihoods as perceived by different stakeholder: target farmers, development organization staff and researchers.**

### 1.4 Thesis outline

The present chapter is the first and is a general introduction to the thesis. In the next chapter, characteristics of *Ricinodendron heudelotii*, the target

species, are presented. In chapter 3, we provide background information on concepts which will be used throughout the thesis. First, a short overview is given of the history of impact assessment in rural development and how impact is measured. Second, the sustainable livelihood approach is discussed.

Next, chapter 4 presents an overview of the general methodology and sampling design. It also provides information about the study site, farmers' livelihoods and the vulnerability context.

The subsequent four chapters discuss the impact of the promotion of *R. heudelotii* kernel commercialization on the different livelihoods assets of farmers. Chapter 5, 6, 7 and 8 tackle issues of respectively the financial, social, human, and natural assets. These chapters are presented in the form of papers of which some were published in international peer-reviewed, scientific journals.

After discussing the impact on farmer livelihood assets separately, we combine all this information in chapter 9. In this chapter, overall impact as obtained by us and combining all the results of the previous chapters, is discussed and this is compared to the impacts as perceived by the target farmers and the staff of the development organization promoting the commercialization of *R. heudelotii* kernels.

The final chapter provides a general conclusion in which the main findings are summarized and discussed. In addition, the research's major implications are given and recommendations for future research are proposed.



## Chapter 2

*Ricinodendron heudelotii*  
(Baill.) Pierre ex Pax



## 2.1 Taxonomy

Genus *Ricinodendron* is represented by two species: *Ricinodendron rautanenii* in southern Africa and *R. heudelotii* in West and Central Africa. In turn, the latter species is divided in two subspecies: *R. heudelotii* subsp. *heudelotii* and *R. heudelotii* subsp. *africanum*. The subspecies differ morphologically and also occupy different geographical ranges (Plenderleith, 2004). Furthermore, some authors distinguish two morphological varieties of *R. heudelotii* subsp. *africanum* based on the characteristics of the leaflets (Tchoundjeu and Atangana, 2006).

In our study, we will be dealing with *R. heudelotii* subsp. *africanum*, which we further refer to as *Ricinodendron heudelotii*.

Family:	Euphorbiaceae
Genus:	<i>Ricinodendron</i>
Species:	<i>heudelotii</i> (Baill.) Pierre ex Pax
Subspecies:	<i>africanum</i> (Muell. Arg.)

## 2.2 Botanical description

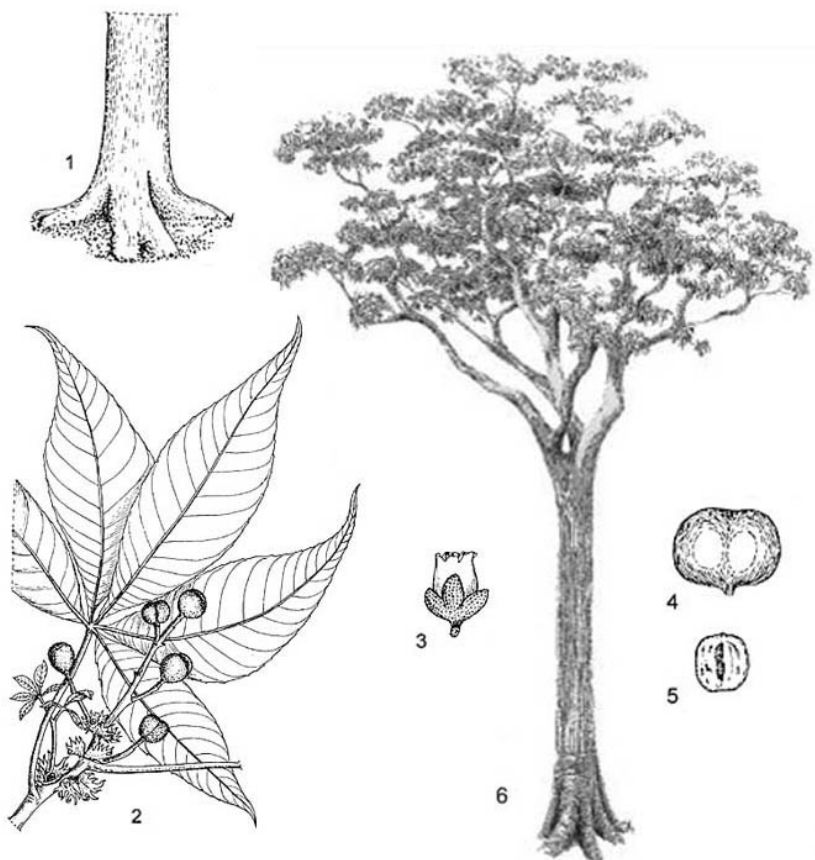
*R. heudelotii* is a large, deciduous tree, with an average height of 20-30 m but it can grow up to 50 m. The typically straight trunk can reach a diameter of 2.7 m and short buttresses. The crown is broad and broken branches can often be observed. The tree's slash is dark red, densely mottled with scattered pits. The bark is grey, becoming scaly with age (PROTA, 2012).

Alternate leaves are digitately 3-5 foliate; leaflets are 10-15 cm long and 3-10 cm broad; subsessile, sessile or united at the base. Leaflets tips are acute and acuminate. The young leaflets are pubescent (PROTA, 2012; Plenderleith, 2006).

The species is dioecious. Inflorescence is yellowish-white with male panicles up to 41 cm long. The female panicles are shorter and stouter. Male flowers have 5 sepals, a 5-lobbed corolla tube and 10 stamens. Female flowers have a stellate tomentose ovary with 2 styles, they are slender and bipartite (Plenderleith, 2006).

The fruit is an indehiscent yellow-greenish drupe, 2 to 3 lobed, generally spherical, 3-5 cm long and 2.5-4 cm width; weight ranges from 19 to 47 g. Fruits smell of overripe apples. The fruit has a fleshy mesocarp and a woody endocarp, and contain 2-3 seeds (Plenderleith, 2006).





**Figure 2.1:** *R. heudelotii*: 1) base of bole; 2) part of branch with young fruits; 3) male flower; 4) fruit; 5) seed (redrawn and adapted by Iskak Syamsudin, PROTA, 2012); and 6) habitus (Plenderleith, 2006)

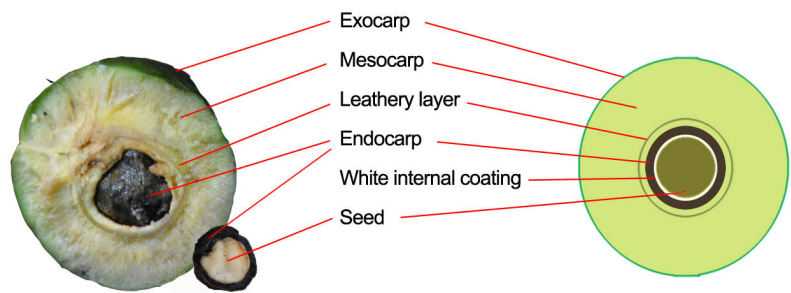


**Figure 2.2:** *R. heudelotii*: a branch with fruits (Latham, 2004)

The woody endocarp or seed shell is red-black-brown, thick and hard with a bright white internal coating and a white-yellow kernel inside (Plenderleith, 2004; Tchoundjeu and Atangana, 2006). The kernels are soft, and cannot be extracted easily from the shells. The size of the seeds is about 1 cm in diameter (Plenderleith, 2004). Kernel makes up 31-33% of total seed weight. Water content of fresh *R. heudelotii* seed amounts to 10% of the fresh seed mass (Kyereh et al., 1999).

## 2.3 Geographic distribution

The species is distributed throughout the whole tropical region of Africa. The two subspecies do occur in two distinct geographical regions: *R. heudelotii* subsp. *heudelotii* extends from Guinea-Bissau to Ghana, while *R. heudelotii* subsp. *africanum* is more widespread and distributed through Nigeria, Cameroon, Equatorial Guinea, Republic of Congo (Brazzaville), Angola, Central African Republic, Sudan, Democratic Republic of Congo, Uganda, Tanzania and Mozambique (Fig. 2.4) (Plenderleith, 2006).



**Figure 2.3:** *R. heudelotii* fruit and seed; figure based on fruit description by Plenderleith (2006); Tchoundjeu and Atangana (2006); Mundi et al. (2012)



**Figure 2.4:** Geographical distribution *Ricinodendron heudelotii* subsp. *africanum* in Africa (Tchoundjeu and Atangana, 2006)

## 2.4 Ecology

### Habitat

*R. heudelotii* is a light-demanding species and can be classified as a species of transitional (secondary) forests. It thrives in scattered gaps, on forest edges and in transitional scrubs and thickets (Plenderleith, 2006).

*R. heudelotii* is able to grow in hot, humid climates, at temperatures between 18 and 32 °C and a rainfall amounts from 1000 up to 3000 mm year<sup>-1</sup>. It thrives across a broad range of soil and moisture conditions if not subjected to severe competition for light (Tchoundjeu and Atangana, 2006; Plenderleith, 2004)

Due to its fast growth, the species can occupy cleared and abandoned farmland (Plenderleith, 2004). Trees have often been protected by farmers and can thus also occur in fallows, cacao plantations, home gardens, crop fields, etc. The species is appreciated because it improves soil fertility (PROTA, 2012; Fondoun et al., 1999). This soil-improving aspect of the tree might be linked to arbuscular mycorrhizae (Högberg, 1982) as well as its deciduous character. However, studies to confirm both hypotheses are not available at the moment (Tchoundjeu and Atangana, 2006).

The tree is known to be vulnerable to windfall, as strong wind causes branches to brake easily (Tchoundjeu and Atangana, 2006, 2008).

### Phenology and regeneration

In Cameroon, flowering takes place in April-May and ripening of fruits occurs in September and October (Tchoundjeu and Atangana, 2006). Fruits are produced in large quantities. Dispersal is mainly gravitational but dispersal by bats, hornbills and rodents has also been observed (Taylor, 1960). Once the fruits have fallen on the ground, fruit pulp rots away. Afterwards, seeds remain dormant for a period of six months up to more than two years (Plenderleith, 2006). Massive regrowth of seedlings under parent, female trees can be observed after farmers cut the understorey vegetation at the beginning of the rainy season. These seedlings will exhibit a density-dependent mortality pattern and are unlikely to survive underneath the parent tree (Plenderleith, 2004). In open light space, trees bear fruit in the 5-10<sup>th</sup> year (Plenderleith, 2004; Sunderland and Tchouto, 1999).

For more info on the species phenology and regeneration patterns, see chapter 7.

### Box 2.1: One of the tree's many uses

The versatility of *Ricinodendron heudelotii* was illustrated in a letter sent to Economic Botany in 1959:

*Travelling from Stanleyville northward through the rainforest of the Congo basin toward Buta I noticed that the telegraph line parallel to the road was attached to living trees all of the same species, R. heudelotii, and regularly spaced. The poles were planted by cutting a 6-10 m pole from the forest and putting it in a hole at the desired place. During the rainy season the pole quickly strikes root and begins to put out branches and foliage. The telegraph wires are placed on the poles some six or more metres above the ground as soon as they are firm. The branches, which sprout at the summit of the poles, rarely interfere with the line (Williams, 1959, cited by Plenderleith, 2006).*

## 2.5 Uses

All parts of the tree are used. The wood is light and easy to carve; bark and roots have therapeutic properties. The seeds contribute to the local cuisine as a condiment in soups and stews. The tree also acts as a host for edible caterpillars, mushrooms and bees (PROTA, 2012). Studies by several authors indicate that *R. heudelotii* is highly appreciated by farmers (Plenderleith, 2004; Ayuk et al., 1999; Sunderland and Tchouto, 1999), as a source of food and commercial products. They also appreciate the species' medicinal use, cultural value and soil fertility improvement features (Plenderleith, 2004). Its deep rooting system is good for erosion control and improving degraded soils, whilst it is not competing directly with adjacent crop roots in the upper soil layers (Anigbogu, 1996; Plenderleith, 2006). Although bark and roots are marketed as well, seeds are by far the most important commercialized part of the tree.

### Wood

The wood of *R. heudelotii* is light, white-coloured and diffuse-porous. The sapwood cannot be differentiated from the heartwood; both are very soft, and sensitive to decay and termite attacks. It is suitable for fishnet floats and life belts, toys and models, paddings or fillings, etc. It is rarely applied for construction purposes, but can be used to carve musical instruments. The



**Figure 2.5:** Some of the uses for njansang; left: pawns for the local game 'songo'; middle: crushed kernels to spice dishes, especially fish; right: nut shells used to harden a road's upper layer

ash of the wood is used in soap making (Guinea, Ghana and Sierra Leone) or as cooking salt (Ghana and Democratic Republic of Congo) (Plenderleith, 2004).

## Leaves

The species produces many shoots and broad leaves which are an ample source of organic matter to improve soil fertility (Plenderleith, 2006). Also the ashes from nutshells make excellent organic fertilizers which are rich in potassium (Mapongmetsem and Tchiegang, 1996). When this deciduous species drops its leaves in the dry season, the latter become an important source of high-quality fodder for sheep and goats in the dry season. Green foliage collected from the plant has an average protein content of 16%, and there is no known toxicity (Anigbogu, 1996).

## Medicinal uses

*R. heudelotii* has a wide number of medicinal uses. The bark appears to be the most frequently used part of the tree for medicine. Bark extract of *R. heudelotii* has been mentioned to treat coughs and fever, acts as an antidote to poison, is used for sexual and fertility problems, to ease menstruation pain, to treat rheumatism and others (Mapongmetsem and Tchiegang, 1996; Plenderleith, 2006; Fondoun et al., 1999; PROTA, 2012). The roots and root bark are mixed with bush pepper (*Xylopi*a spp.) and salt in Nigeria for use

as a laxative. In Cameroon, an infusion of the stem bark or root bark is taken to treat diarrhoea (Ayuk et al., 1999; Plenderleith, 2006).

## Seed

Seeds are used for multiple purposes. In Sierra Leone, they are used in rattles for bundu dances, while in Cameroon they are used in musical instruments as well as for local games: 'songo' in Cameroon and 'okwe' in Nigeria (Plenderleith, 2006).

The hard endocarp contains seeds which are the edible part of the fruits. Fruit pulp and endocarp are usually discarded when seeds, or more specifically seed kernels, are extracted (Plenderleith, 2004).

Most often kernels are dried and used as a condiment in recipes. Crushed njansang is used to thicken and flavour soups, fish stews and other dishes (Ayuk et al., 1999; Sunderland and Tchouto, 1999). They are also cooked with fish, chicken and vegetables or eaten plain (Amadi, 1993; Mapongmetsem and Tchiegang, 1996; Brocklesby and Ambrose-Oji, 1997; Ndoye et al., 1997). In addition, kernels may be roasted, made into a paste and used for making a sauce similar to peanut sauce (Plenderleith, 2006; Fondoun et al., 1999).

Extraction of the seed kernels is an elaborate and time-consuming process (Fig. 2.6). Farmers allow fruits to fall from the trees, gather them into piles, and leave them to rot for 5-8 weeks. Once rotten, the seeds still within their shell are washed to prevent that the rotten organic matter will blacken kernels during further processing. Next, they are subjected to one or two consecutive boiling sessions that are intended to crack the seed shells. These cracks in the seed shell enable the kernels to be extracted using a sharp object such as a knife or nail. The kernels are then dried (PROTA, 2012; Tchoundjeu and Atangana, 2006).

Time between fruit collection and eventual njansang sale generally takes 3-4 months or more. Especially the rotting process of the fruit flesh takes time. In addition, along the processing line, the product is often stored for longer periods due to the fact that at certain months people are forced by other, more stringent agricultural and non-agricultural activities than njansang processing. Moreover, the product is quite easily stored without losing its quality (Plenderleith, 2006).

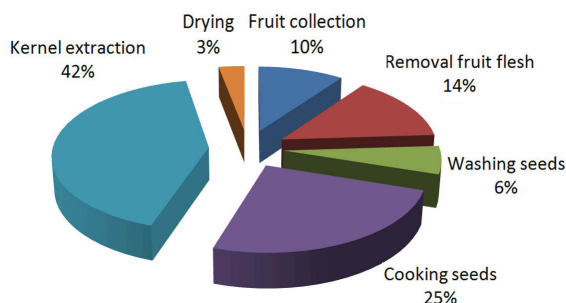
Once the fruit flesh has rotten away, the production of 1 kg njansang takes about 4 hours according to Nakuna Tsala (2009). Especially cooking and extraction of the seed from its seed shell are time-consuming (Fig. 2.7). The





**Figure 2.6:** The main njansang processing activities which are performed by farmers: from fruit collection to kernel sale





**Figure 2.7:** Relative time needed for the main njansang fruit processing activities (Nakuna Tsala, 2009)

costs to produce one kg of njansang was calculated by the latter author to be 683 FCFA (1.46 USD)(data from 2009).

Seeds can be processed to obtain oil. The oil is light yellow, with a pleasant taste resembling that of groundnut oil. Fondoun et al. (1999) extracted the oil from the kernels of *R. heudelotii* and found an oil content between 49% to 63%. It has been suggested that the high oil content of the seed together with the high proportion of poly-unsaturated fats in the oil, indicates its suitability for commercial production of cooking oil and margarine as well as for soaps and pharmaceutical preparations (Plenderleith, 2004). However, njansang oil is traditionally not transformed in oil, and oil extraction and use are still in an experimental stadium. Hence, njansang oil is not yet produced in large quantities.

Table 2.1 lists the kernel's nutrient composition. The most striking features are the high energy value as compared to that of local staple foods and the high poly-unsaturated fat and crude protein content (Tchankou Leudeu et al., 2009). The presence of proteins is important as lack of proteins is generally one of the main causes of malnutrition in tropical Africa (Tiki Manga et al., 2000).

## 2.6 Markets and trading

In Cameroon, market surveys undertaken in different regions of the country indicate a promising market for *R.heudelotii* kernels (Plenderleith, 2006; Mapongmetsem and Tchiegang, 1996).

Prices of all products sold by women from the Korup region of Cameroon,

## **Box 2.2: The future of njansang: improving product processing**

### **From fruit to kernel (Mundi et al., 2012)**

The World Agroforestry Centre has been investigating new processing methods which could reduce the time needed to obtain njansang kernels. Two techniques have been developed and studied by Mundi et al. (2012).

Usually, after farmers collected *R. heudelotii* fruits, these fruits are left rotting during a month. They are left to rot to be able to easily separate the seed (in its shell) from the fruit pulp. The first new technique as proposed by Mundi et al. (2012) aims to shorten this rotting process. Instead of letting the fruits rot, njansang fruits are boiled. Boiling fresh fruits for an hour removes the fruit pulp as well as the thick leathery seed coat lining. Compared to the traditional rotting technique, this means a gain in time of 4 weeks.

The boiling technique has a number of advantages as well as some disadvantages. The advantages are that it significantly reduces processing time whereas at the same time it reduces the health issues associated with traditional processing. For instance, the decaying fruit produces a dark liquid that leaves persistent stains on the hands of handlers. The decaying fruit is also frequently infested with maggots, which can get under the skin of processors. Furthermore, the residual fruit pulp remaining after cooking could be used as a fertilizer.

On the other hand, this technique also implies that fresh fruits, which are generally left to rot on site, have to be transported to farmers' domiciles. Because *R. heudelotii* trees are usually widely dispersed, and the fruits are quite heavy, this implies many hours for transport. In addition, this processing technique consumes firewood and water which has to be collected or purchased.

**Box 2.2: The future of njansang: improving product processing (continued)**

A second technique that can be used to reduce njansang processing time is dry roasting of the hard nut to prepare it for kernel extraction. Preparation of the nut for kernel extraction means that a crack in the nutshell has to be created which would then enable further kernel extraction. Traditionally, this means njansang nuts are put in boiling water, a process which can last up to two days. The new technique involves drying the nuts in a shallow roast pan during 15 min. Applying direct heat to the nut probably causes pressure within the nut forcing the shell to crack. Again, processing time can be reduced with about 48 hours as compared to the traditional boiling approach. In addition, kernels are already dry after cracking. Thus, the traditional drying process can also be eliminated.

Although very promising, both these techniques, still have to be evaluated thoroughly with regard to their advantages and disadvantages as compared to other methods. Time will tell whether or not these techniques will eventually be accepted and broadly adopted by njansang producers.

**Table 2.1:** Nutritional value of *R. heudelotii* kernels (values in % unless otherwise mentioned) (Tchoundjeu and Atangana, 2006).

Constituent	Quantity (%)
Water	3.2
Crude protein	24.3 - 65.2
Fatty acid	47.4 - 55.3
of which polyunsaturated	> 60
Total carbohydrates	5.6 - 9.3
Crude fibres	8.9 - 9.3
Ash	10.5 - 17.8
Energy value (kcal/100g)	532

including *R. heudelotii* kernels, were reported to have been increasing over 5 years (1993-1998) prior to a study performed by Vabi and Tchamou (1999). An extrapolation from market surveys in Cameroon conducted by Leakey (1999b) suggests that total trade value of 4 indigenous fruits (*R. heudelotii*, *Irvingia gabonensis* and *I. wombolu*, *Dacryodes edulis* and *Cola* spp.) from the humid forest zone attained 1.2m USD over the 6-month January-July 1995 period. Of this, *R. heudelotii*'s share was estimated to be 460,200 USD. According to Ndoye et al. (1997), a total of 36 ton of njansang worth 43.4m FCFA (82,738 USD) was sold in Yaoundé in 1995.

Njansang's market value does not only vary with season, but also with geographical differences in demand and resource availability. Ndoye et al. (1997) found a clear difference in the percentage net marketing margin of *R. heudelotii* kernels between the different large markets in the humid forest zone in Cameroon. Njansang values in markets in the Littoral province of Cameroon were about double of those in the Centre province. This mirrors the fact that *R. heudelotii* is readily available in the Centre-South provinces, but relatively scarce in the Littoral province. In addition, demand is high in the Littoral province because fish is an important staple there and *R. heudelotii* is a popular condiment used to spice fish dishes (Ndoye et al., 1997).

Markets for *R. heudelotii* are concentrated in the vicinity of the large urban centres of Cameroon. Wholesale traders buy from local markets and villages, and sell to larger urban centres and for export (Laird, 1999). Processing and transport are the main marketing functions provided in the market chain for njansang. Processing is being carried out by the initial gatherer. Most farmers sell immediately after processing to meet cash needs at their domicile. This also saves them transport costs. Market traders buy small



**Figure 2.8:** Machine to crack njansang nuts, developed by ICRAF in 2007 (Tabougue Nguéfac, 2011); left: nuts put into the machine; middle: machine in operation in Ebassi; right: cracked nuts as they come out of the machine

quantities throughout the year. Storage is undertaken by wholesalers who buy in bulk during the harvesting season and sell during the off-season when prices are higher. Wholesalers also perform arbitrage, moving products from areas where abundance is high and prices are low, to areas where there is a demand but no supply (Plenderleith, 2006).

*R. heudelotii* seeds, and to a lesser extent bark and roots, are widely traded in West and Central Africa, both within countries and across borders. It is estimated that exports to neighbouring countries from markets in Cameroon amounted to at least 980,000 USD in 1996 (Ruiz Pérez and Byron, 1999). There is also trade in NTFPs between Cameroon and some large European cities such as Paris and Brussels where there are large numbers of immigrants from West and Central Africa (Tabuna, 1999). The trade in African NTFPs is known to employ several hundred persons in France and Belgium. In Paris, a survey in tropical grocery stores listed *R. heudelotii* among the NTFPs most frequently imported into France. Tabuna (2000) revealed that a total of 4 ton of njansang was exported from Cameroon to Europe in 1998.

## 2.7 Propagation and cultivation

Shiembo (1994, cited by Plenderleith, 2006) reported that farmers in Cameroon rarely plant the species because planting stocks are not readily obtainable as the seeds are difficult to germinate. In rural areas, farmers do sometimes transplant wildlings onto their farms (Ayuk et al., 1999). When wildlings are transplanted, little is known about the characteristics of these

### **Box 2.3: The future of njansang: improving product processing**

#### **Nut-cracking machine** (Tabougue Nguefac, 2011)

Njansang processing is a cumbersome, time-consuming task. In order to facilitate processing, ICRAF has been working on new processing technologies. One of its contributions has been and still is the development of a nut-cracking machine (Fig. 2.8). This machine wants to facilitate the extraction process of the kernels from its hard nutshells. The machine was first introduced in 2007 in some villages in Cameroon where ICRAF was running its projects. The nut-cracking machine has a single cylinder, a 4.41 kW engine and can crack 1 kg njansang in 2 min. However, after cracking the nuts, nut shells and kernels have to be separated which takes an additional 40 min. The traditional manual method takes about 60 min to obtain 1 kg of njansang. The cracking machine thus works faster and also minimizes the chances of injury as during manual cracking, opening the shell with sharp objects such as nails, often causes hand injuries.

Considering ultimate product quality and effectiveness of the methods, the manual method is still better than the mechanised one. With the manual method, 97% of kernels are extracted without damaging them. With the mechanised method only 70% of the nuts come out in one piece, while 30% is partly broken, lowering their market value.

Costs which are related to the cracking machine (purchase, maintenance, etc.) are currently too high to make mechanised extraction ( $132 \text{ FCFA kg}^{-1}$ ) more profitable than manual extraction ( $128 \text{ FCFA kg}^{-1}$ ). This could change in the future if higher quantities would be processed by the machine, lowering the relative share of fixed costs. Tabougue Nguefac (2011) calculated that a minimum of 8000 kg should be annually processed by the machine in order to be equally profitable as manual extraction. In the case of Epkwassong, this corresponds with cracking 170 kg of nuts per person per year.

**Box 2.3: The future of njansang: improving product processing (continued)**

Farmers state that the main reasons for not using the machine are: the high quantity of broken kernels, the distance which has to be covered to get to the cracking machine (which is heavy and remains at a central location) and the small quantities of njansang they need to process. According to 86% of the farmers the major advantage of the machine is, that cracking has become less difficult, resulting in less injuries. Only 64% states that it reduces the time needed to crack. Hence, if the technology of mechanical njansang cracking is to become widely accepted and disseminated, changes are needed. These changes can be technical, making the machine more effective and efficient, and/or can be related to improved business management and logistics, such as significantly increasing njansang quantities to be processed or decreasing transportation costs.

In 2010, a second, improved prototype of the machine was developed and introduced in the villages. The idea is that the latter machine should be more effective, producing less broken kernels. Further studies have to determine the adoption of this new nut-cracking device.

individuals. Uncertainty always exists about the amount of fruits that will be produced, whether the seeds shells will be easy to crack, and even more important, whether the tree will be a female plant, producing fruits.

To overcome these problems, vegetative propagation techniques can be used. This implies that the positive characteristics for which the mother tree was selected will be similar in the newly propagated tree. Hence, the most stable means of improving and subsequently maintaining good quality of *R. heudelotii* kernels for on-farm use is by tree domestication including vegetative propagation (Plenderleith, 2006).

Njansang has only been under active domestication, including vegetative propagation, since 1995, when ICRAF established experimental plots of the species in Cameroon. As a result, information on patterns of genetic diversity, identification of potential genetic resources to use in further improvement, and the establishment of reference germplasm collections are still all rudimentary (Tchoundjeu and Atangana, 2006). Major constraints for accelerating domestication include the difficulty in distinguishing male and female trees at young ages and seed coat inhibition of germination. The germination rate of njansang is less than 4%, due to seed dormancy (Mapongmetsem et al., 1999a). As seed germination is usually very low, most studies have focused on vegetative propagation techniques (Shiembo et al., 1997; Ngo Mpeck et al., 2003).

Some work has been done on using leafy stem cuttings for vegetative multiplication (Shiembo et al., 1997). *R. heudelotii* is easy to root, provided a good physiological state of the cutting and favouring humidity requirements within the propagator (maximum rooting percentages of 80) (Shiembo et al., 1997).

Marcotting has not yet been standardised for the species and is not common practice yet. The first branch of an adult tree is usually very high and the tree is dangerous to climb in; its branches are fragile and can break off easily (Tchoundjeu and Atangana, 2006).



# Chapter 3

## Impact assessment of development projects



### 3.1 Measuring impact of development projects

#### Defining impact assessment

For people and organizations involved in development, impact and impact assessment (IA) are terms that refer to measuring the effects of development interventions (Leeuw and Vaessen, 2009; Roche, 1999; Maredia, 2009). In general, the terminology can be used for both short-term and long-term effects. Over time, however, definitions were amended to include that changes should be lasting or significant. Lasting refers to long-term changes, while significant refers to the importance of the changes. The latter term has been added to include also non-lasting, short-term but highly important changes, which is typically the case in zones that are subjected to a rapid, unpredictable change such as what occurs in conflict areas (Maredia, 2009).

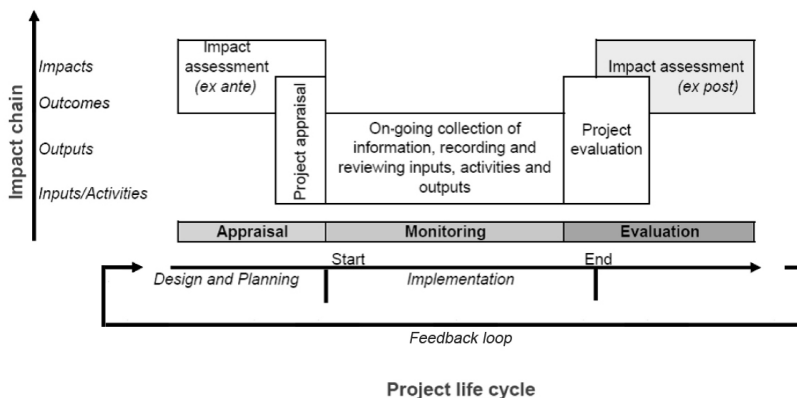
The following definition is used by the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD):

***Impact assessment** is the systematic analysis of the positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended (OECD, 2002).*

It is clear that the interpretation of 'significant' or 'lasting' is not absolute as it relies on human judgement (Roche, 1999). In addition, it is also primordial to evaluate the respective development interventions embedded in their broader context, and against the historical background and ongoing changes in a certain region (Roche, 1999). Maredia (2009) captures this partly by adding to the impact assessment's definition that development interventions should be analysed in relation to a counterfactual, a control group. Also, OECD (2002) and Leeuw and Vaessen (2009) state that the use of counterfactuals is often necessary but is not always needed or possible, and they do not include the term in their definition.

#### Impact assessment within the project cycle

Figure 3.1 illustrates the pathway of a classic project cycle and the relative positions of project appraisal, monitoring, evaluation, and IA. A feedback loop can connect the end of the cycle with the beginning and be the basis for sequential, new projects. In many development organisations, multiple projects overlap. Although the classical view of the project cycle implies a specific time frame with well-defined nodes. In practice, these boundaries



**Figure 3.1:** A general overview of the types of assessments in a project life cycle and impact chain framework (Maredia, 2009 based on Roche, 1999)

are often not so sharply delineated (Maredia, 2009; Leeuw and Vaessen, 2009).

*Ex ante* and *ex post* approaches are distinguished. *Ex ante* IAs typically occur at the beginning of a project and try to predict the project's potential impacts. It forms often part of the project's appraisal. *Ex post*, retrospective IA takes place when the project is finished and tries to evaluate the changes brought forth by the interventions. Nonetheless, *ex post* IA occurs once project interventions have been completed, ideally, it is taken into account at the project planning stage. In this way, baseline data can be collected and if required permanent monitoring and evaluation during the entire project cycle can be performed in order to draw reliable conclusions at the end. It is clear that results of project monitoring reinforce impact assessment data. Monitoring provides detailed information about changes occurring during the interventions, can improve understanding and put the observed positive and/or negative impacts in perspective (Maredia, 2009).

Most important **acronyms** from **Fig 3.2**:

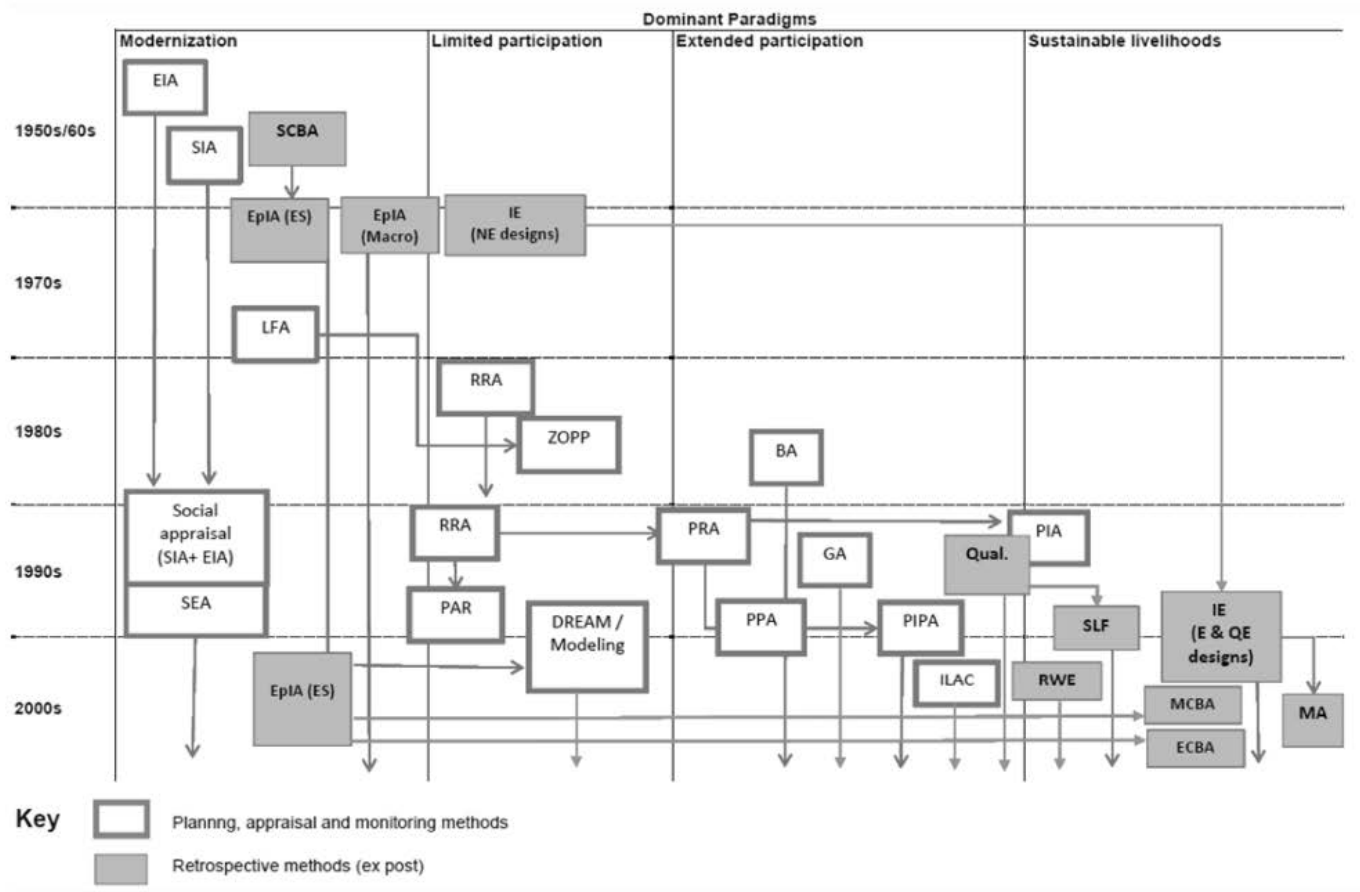
BA: Beneficiary Assessment; ECBA: Extended CBA;  
 EIA: Environmental Impact Assessment; EpIA: Ex  
 post Impact Assessment; ES: Economic Surplus;  
 GA: Gender Analysis; IE: Impact Evaluation; IE  
 (E & QE designs): IE Experimental and Quasi-  
 Experimental designs; IE (NE designs): IE Non-  
 Experimental designs; ILAC: Institutional Learning  
 And Change; LFA: Logical Framework Analysis;  
 MA: statistical Meta-Analysis; MSBA: Meta-CBA;  
 PPA: Participatory Poverty Assessment; PRA;  
 Participatory RA; RRA: Rapid Rural Appraisal;  
 RWE: Real World Evaluation; SCBA: Social Cost-  
 Benefit Analysis; SEA: Strategic Environmental  
 Assessment; SIA: Social IA; SLF: Sustainable  
 Livelihoods Framework; ZOPP: Zielorientierte  
 ProjektPlanung.

## The evolution of impact assessment

Whereas the first development projects in the 1950s were not evaluated at all, the first impact assessment methods were based on an *ex ante* approach to predict a project's environmental, social, but mainly economic impacts (Roche, 1999). Since then, the thinking and concepts have developed much. Figure 3.2 (Maredia, 2009) represents an overview of the different methods and approaches used over time.

Initially, in the 1950s, *ex ante* impact assessments and appraisal approaches were typically applied by development agencies to predict the expected results of their interventions. They served as a benchmark to approve, adjust or reject project funding. Adapted versions currently still serve as *a priori* selection criteria for funds allocation.

The next generation of monitoring and evaluation tools was based on the logical framework analysis (LFA). The latter was originally developed and implemented in development circles by the US Agency for International Development. Today, variants of this framework are used by nearly all aid funding agencies, and therefore by thousands of organisations around the world receiving those funds such as the World Bank, United Nations



**Figure 3.2:** Evolution of planning, monitoring, and impact assessment methods and approaches between the 1950s-2000s (Maredia, 2009). Acronyms written out in the box on the former page.

Children's Fund (UNICEF), Denmark's development cooperation (Danida), etc. (Dale, 2010; Gasper, 2000; Coleman, 1987).

In the late 1980s and 1990s, new methods arose that focused on the participation of local people and communities in the evaluation exercise. The people targeted by development now became actively involved in the planning, monitoring and evaluation process, albeit in different degrees. More recently, the inclusion of powerful computing technology and GIS-based methods made available new methods especially for spatially explicit *ex ante* impact assessment (e.g. Legg, 2006).

In short, the evolution of development theories and practices has evolved from a solely top-down approach towards a participatory, bottom-up approach where involvement of local people and their contribution towards finding appropriate and sustainable solutions to (their own) problems has become increasingly important.

An up-to-date overview of the evolution of impact assessment methods and approaches in the broad field of development, and agricultural development in particular, can be found in Maredia's study (2009). Maredia's work is an updated version of the overviews provided by Roche (1999) and Howes (1992).

## Methods to measure impacts

Impact assessment evolved from an approach with no evaluation at all, to *ex ante* and in a further stage *ex post* methods. The latter retrospective approaches provide direct quantified proof of actual changes induced by development projects. Derived results can be used in a later stage to improve future interventions (de Janvry et al., 2010; Leeuw and Vaessen, 2009). In the present study, an *ex post* impact assessment will be conducted and we will thus now further elaborate on this particular issue.

In the area of agricultural development, *ex post* impact assessment began in the 1960s with a focus on economic impacts. Over time, the framework expanded and incorporated a broad variety of other dimensions in farmers' livelihoods such as social issues, poverty, health, gender, and environment (de Janvry et al., 2010).

Recently, there is a push towards the use of more rigorous methods in IA such a experimental and quasi-experimental design, based on comparison with control groups. De Janvry et al. (2010) as well as Maredia (2009) state that the inclusion of a control group is an important facet in recent impact assessment methodologies. The use of control groups will aid to improve

the proof on what works and what doesn't in development. Counterfactuals serve as a benchmark for comparison. They enable to take into account changes occurring over time without development interventions.

One widely accepted experimental design is based on Randomized Control Trials (RCTs) which are used for estimating the effects of treatments, interventions, and exposures on outcomes (Austin, 2011). Random treatment allocation should ensure that treatment status will not be confounded with either measured or unmeasured baseline characteristics. However, in practice RCTs do have some limitations in particular when used for impact assessment of agricultural technologies (de Janvry et al., 2010). It is for example very difficult to distinguish between possible adopters and non-adopters of new agricultural technologies (de Janvry et al., 2010). The inclusion of future non-adopters in the sample pool introduces bias and distorts the results on the impact of the introduction of this new technology. Hence, in the RCT approach, the selection of treated and control group remains difficult as is the case in all impact assessment methodologies applying a difference-in-difference approach. Furthermore, it is often advised to work in real-world conditions and work with quasi-experimental designs rather than with RCTs, thus avoiding this problem. For these approaches, techniques like propensity score matching have been developed to ensure the selection of a representative control group (Maredia, 2009; Austin, 2011; Andam et al., 2010). In short, the propensity score takes into account variables which are ought to have an influence on the outcome variable. Next, matching propensity scores tries to put together those samples in treated and control groups which are most alike. Thus, trying to isolate the effect of the treatment keeping all other variables as much alike as possible.

Another recent trend is to embed impact assessment of development projects into a larger framework encompassing the socio-economic environment people live in. One of the most often used frameworks is the Sustainable Livelihoods Framework (SLF) (DFID, 1999). It is a tool that allows to evaluate changes in people's livelihood on a multi-dimensional level (DFID, 1999; Maredia, 2009). Maredia (2009) mentions the use of SLF as the most recent development where agriculture takes its place together with other rural and non-rural activities, which are important in the construction of viable livelihoods. This cross- and multi-sectoral diversity of rural livelihoods has become the cornerstone of rural development policy to reduce rural poverty (Maredia, 2009).

In accordance with the ideas presented above, Roche (1999) distinguishes three main approaches to measure *ex post* impacts. The first is mainly 'project-out' and comes down to assessing the specific project's objectives and indicators. Hereby, the focus remains on the project and its predicted

outcomes. The problem with this often applied approach is that it can lead to 'egocentric' results which exaggerate the importance and contribution of project interventions without taking into account the context or the socio-economic environment in which these changes occur (Maredia, 2009). The second approach focuses on the project being assessed but also includes the potential changes that may have occurred in a broader context of farmers livelihoods in the region. The use of 'control groups' can provide this additional information (Maredia, 2009). Finally, Roche (1999) mentions that some studies use a so-called '*context-in*' approach. This means, looking first and foremost at overall changes in people's lives and then exploring the importance of these changes and the sources of change, one of these sources being the project under review. This approach seeks to situate project-induced changes within the context of other changes. Roche (1999) states that a combination of these approaches would be ideal, but might not be always feasible due to financial and logistic limitations.

There exists a variety of methods and approaches to assess impacts. The choice of which method to use will depend on objectives, resource availability and other preconditions. The most suitable approaches can be selected from a wide spectrum of available methodologies ranging from top-down to bottom-up evaluations, quantitative to qualitative approaches, etc. (Leeuw and Vaessen, 2009). Many authors suggest to combine several different methods because each method has its particular value and no single best method exists (Leeuw and Vaessen, 2009; Maredia, 2009; Schreckenberget al., 2005).

However, literature does provides 'best practices' for assessing impacts. Guidelines exist to assess impacts of (agricultural) development projects at beneficiary level which can be applied irrespective of the nature of the selected methods (e.g. Maredia, 2009; IEG, 2009; de Janvry et al., 2010; Davis et al., 2008 and Ashley and Hussein, 2000). Table 3.1 lists the most important guidelines derived from literature and the degree to which they were adopted by the present study. Methods for micro-economic impact analysis have witnessed numerous recent developments. However, de Janvry et al. (2010) observed that many of the guidelines and new approaches developed are currently not widely or appropriately used in practice.

## **Impacts of NTFP commercialization**

The multiple impacts of NTFP commercialization are a topic of great interest. First of all, much was expected of NTFP commercialization as it was put forward by development agencies as well as conservationists as a way to protect forests from deforestation practices while at the same time providing income to local communities and alleviating poverty (Neumann



**Table 3.1:** Guidelines to assess impacts of rural development projects at beneficiary level [based on Maredia, 2009; IEG, 2009; de Janvry et al., 2010]

Guidelines	In our study
Village is the unit of randomization (to avoid spillovers)	++
Selecting counterfactuals minimizing selection bias	++
Spillovers to counterfactuals should be avoided	+
Account for non-observable characteristics of the adopters (randomization)	++
Adopters are not to be appointed by external force	++
Controlling for pre- and post-program differences in participants	+
Difference-in-difference methods preferred to single difference methods	++
Collecting policy-relevant data at baseline and follow-up to estimate program impacts	++
Using more than one technique to infer patterns of impact from data collected	++
Incorporating qualitative techniques to allow for triangulation of findings	++
Allowing sufficient time before assessing program impacts	+
Take time into account as impact changes over time	-
Plan evaluation beforehand	-
Assessing impacts and reporting results beyond 'mean outcomes'	+
Sample groups are big enough to establish statistical inferences with minimal attrition	+
New technology introduced in entire village, technology should be sold at market price	-
Do not limit to Randomized Control Trial, use data on technologies that are already implemented	+
++: accounted for in our study	
+: partly accounted for in our study	
-: not accounted for in our study	

and Hirsch, 2000). Second, commercialization opportunities for NTFPs have increased throughout the world as economic liberalisation is opening new markets whereas political changes are enabling communities to take a greater role in the management of their forest resources (Neumann and Hirsch, 2000; Laird et al., 2010).

The impacts from NTFP commercialization are very diverse. From a financial point of view, commercialization of NTFPs has shown to be able to increase farmers' incomes (Mahapatra et al., 2005; Muniz-Miret et al., 1996). It can also lead to people being trapped in a cycle of debt that keeps them impoverished, by for instance providing farmers consumer goods on credit at inflated prices to be paid for with NTFPs products (Romanoff, 1992; Gubbi and MacMillan, 2008). Reported impacts of NTFP commercialization on natural assets and the environment were mainly negative or neutral (Jenkins and Oldfield, 1992; Thomas et al., 2011), with overexploitation and resource depletion leading to local extinction of NTFP-producing species, as worst case scenarios (Terry and Cunningham, 1993). Studies on the impacts of NTFP commercialization on social assets and gender equality have also led to divergent results. Some authors praise the importance of NTFP commercialization for women and recognize the latter's key role in the whole NTFP marketing process and the development of the products' economic potential [(Brosius, 1995) cited by (Neumann and Hirsch, 2000); (Bishop and Scoones, 1994)]. Other studies emphasize that increasing economic values of NTFPs and the arrival of new processing technologies, favour male participation in the value chain and have a negative impact on women, even eliminating their involvement (Ghatak, 1995; May, 1990).

NTFPs are characterized by high variability in many aspects. The latter is concerned with the physical aspect of NTFPs, the natural environment they are extracted from as well as the socio-economic and political environment people extracting NTFP live in. Hence, making general statements on the impact of NTFPs is very difficult if not impossible. Nevertheless, attempts have been made to compile studies of different types of NTFP and perform meta-analysis with the aim of coming up with an all-embracing framework to estimate the impact of NTFP commercialization (Newton et al., 2006). These meta-analysis are very important to make generalizations about NTFPs and support policy-makers in making decisions and establishing a legislative framework about NTFPs. In addition, the theoretical framework of NTFP commercialization is currently very poorly developed (Newton et al., 2006).

To support the development of a theoretical framework for NTFPs and perform meta-analysis combining the different types of NTFPs, well-documented case studies are indispensable. In their review of NTFP commercialization, Neumann and Hirsch (2000) state that lack of knowledge about uses, biology and management of most commercial NTFPs is a major obstacle to the development of NTFP value chains. Furthermore, only a few studies assessing NTFP which are of local economic importance are available.

Impact of NTFP commercialization has been measured using a whole range of quantitative and qualitative methods depending on the study's objectives, resources available, skills of the researchers, etc. (Neumann and Hirsch, 2000; Marshall et al., 2006b; Wong, 2000). However, Godoy and Lubowski (1992) and Neumann and Hirsch (2000) conclude that researchers must pay more attention to methodological issues if future valuation studies are to produce generic results.

If meta-analysis is to be performed, methodological procedures should be clear and if possible similar across different studies. The use of a generic framework based on a strong theoretical background would greatly improve the possibility to perform meta-analyses (Arnold and Ruiz Pérez, 1996; Newton et al., 2006). Some researchers used relative grading systems to evaluate different studies (Newton et al., 2006; Kusters et al., 2006). Basically, these studies applied 5-point Likert-items to evaluate changes in indicators of interest. This approach enabled studies to be compared and to perform meta-analyses (e.g. Kusters et al., 2006).

## 3.2 Sustainable Livelihoods Approach

### Introduction

The Sustainable Livelihoods Approach (SLA) was put on the map by the influential work of Chambers and Conway (1992; see also Chambers, 1988). Presently, the concept is widely adopted. It offers a very important framework, supporting development programs and projects focusing on rural livelihoods. Very shortly after its introduction, the sustainable livelihoods concept had been implemented by important donor and development organizations such as Oxfam, CARE, United Nations Development Programme (UNDP), DFID and FAO (Solesbury, 2003; Baumann, 2002). In addition, it has not only been adopted in the field of development but also in many other fields involving livelihoods of rural and urban areas (Hussein, 2002; Knutsson, 2006; Norton and Foster, 2001; Allison and Ellis, 2001; Erenstein et al., 2010; Mahdi et al., 2009).

One of the main reasons for its swift adoption was that the concept offered a fresh vision and that it is a holistic and integrative approach with the capacity to analyse and understand the complexity of rural development (Chambers and Conway, 1992; Knutsson, 2006).

The concept emerged indirectly from the Brundtland Commission Report of 1987 which put the term sustainability firmly on the global political agenda. In a further stage, the framework evolved through a combination of research efforts of different institutes (eg. Institute of Development Studies), NGOs (e. g. Oxfam, CARE) and donors (eg. DFID) (Baumann, 2002).

The concept was developed as a reaction to earlier approaches of development which focused only on economic aspects such as production, employment and income. In the 1980s, the understanding came that the industrial vision did not capture the complex and diverse realities of people's life. Livelihoods of the poor are complex and dynamic and are characterized by a diverse portfolio of activities and assets (Degrande, 2005).

SLA incorporates in its analytical framework much of what is considered as 'best practice' approach in development circles (Hussein, 2002; DFID, 1999). However, within this framework there is still place for flexibility and specificity without compromising the concept's core principles (Hussein, 2002).

## **The Sustainable Livelihoods Framework DFID (1999)**

### **Context**

The Sustainable Livelihoods Framework (SLF) provides a holistic view on people's livelihoods as schematically represented in Fig. 3.3. In its simplest form, it views people operating in a context of vulnerability. Within this context, they have access to different kinds of assets which can reduce poverty. These assets obtain their meaning and value through the prevailing social, institutional and organizational environment. It is also this environment that influences people's choice of adopting certain livelihood strategies in pursuit of beneficial livelihood outcomes and objectives.

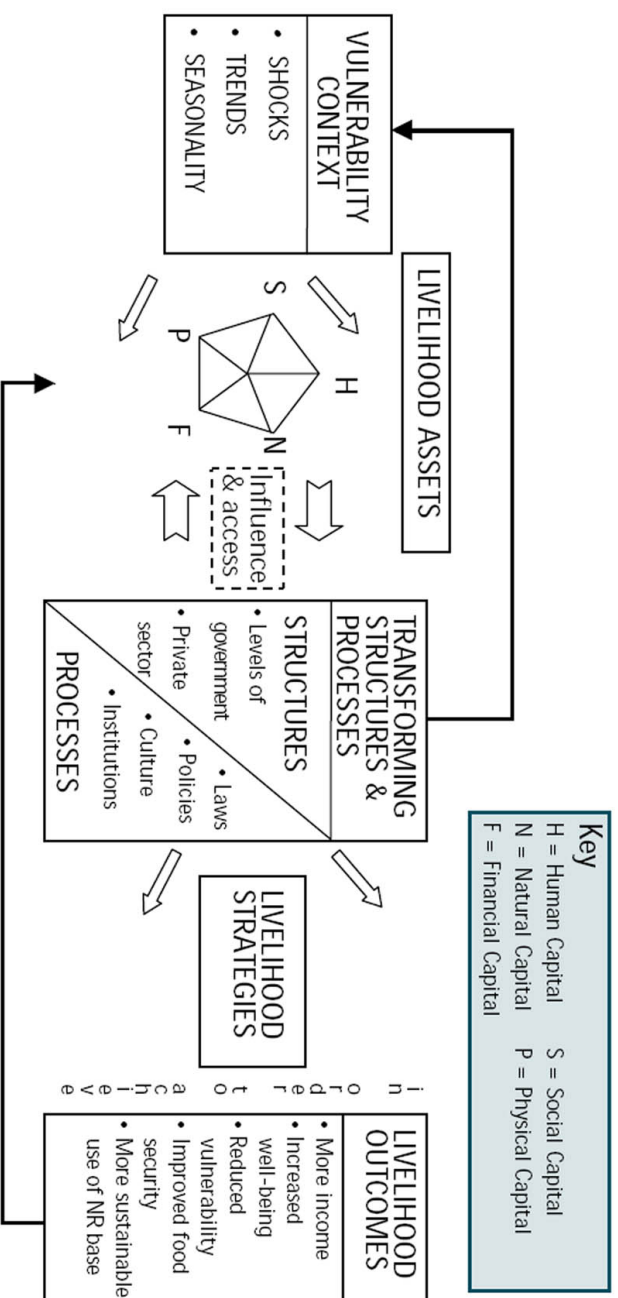
Thus, the core idea of 'sustainable livelihoods' includes the requirement to understand and act upon the asset of the poor, the risks they are facing, and the institutional environment that facilitates or blocks them in their own endeavours to build pathways out of poverty (Hussein, 2002).

Depending upon the projects' or studies' objectives and context, emphasis is put on specific aspects of this framework. For this study, we focus on the right hand side of the framework where livelihood outcomes are situated. Livelihood outcomes and their impact on livelihood assets are the core of the development impact assessment and thus of this study. The goal of development interventions is to assist people to obtain these desired livelihood outcomes.

These latter outcomes are extremely complex and vary according to place, time and context, and individual person. Even though they are complex, understanding them is crucial to be able to support people to achieve them. In most cases, livelihood outcomes can be thought of as the inverse of poverty. They are the short-term and long-term life goals of an individual. If, for example, an individual describes poverty as food insecurity and a lack of key services, the livelihood outcomes s/he will strive for may include food security and improved access to services. This looks straightforward, but in practice it is often difficult to grasp an individual's dynamic livelihood goals.

In addition, livelihood outcomes in turn have a direct or indirect bearing on livelihood assets. For instance, a secure, regular income as an outcome, influences the financial asset directly but can also influence all other assets in an indirect way.

The SLF has been subject to criticism because it emphasizes certain aspects of livelihoods which can lead to the neglect of other (sometimes) important features of people's livelihoods. The neglect of power relations is one of these shortcomings of the SLF (De Haan, 2012). Other weaknesses of

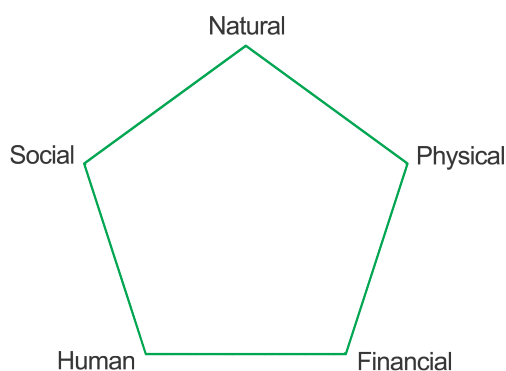


**Figure 3.3:** The Sustainable Livelihoods Framework (DFID, 1999)

the framework are related to: poor integration of informal structures and processes, gender issues, etc. (Krantz, 2001; De Haan, 2012).

### The assets

The sustainable livelihoods approach is based on the assumption that people require a range of assets to achieve their desired livelihood outcomes. No single category of assets on its own is sufficient to yield the manifold livelihood outcomes that people seek to obtain. This is particularly the case for poor people whose access to any given category of assets tends to be very limited. As a result, they have to seek ways to combine the assets they do have in innovative ways to ensure survival.



**Figure 3.4:** At the core of sustainable livelihoods framework lie the five types of assets as presented in the figure and discussed in Box 3.1. The idea is that people possess a range of assets which they can combine to try to achieve their desired livelihood outcomes (DFID, 1999)

People's assets have been divided into five groups which can be represented in the form of a pentagon (Fig. 3.3 and 3.4). This pentagon lies at the core of the livelihoods framework, 'within' the vulnerability context. All assets can be assessed separately, for instance, through the incorporation of specific (quantifiable) indicators. Nonetheless, it is important to study the interaction between the different assets as they strongly influence each other. In addition, these complex relationships should be observed within the vulnerability context that surrounds them whereas they should also be related to the prevailing cultural practices, and the types of structures and processes that transform assets into livelihood outcomes.

**Box 3.1: Assets of the sustainable livelihoods framework  
(Carney, 1998)**

The sustainable livelihoods approach is founded on the idea that people need a range of assets to achieve positive livelihood outcomes. These assets are visually presented in the form of a pentagon, which allows inter-relationships between the various assets to be visualized.

1. **Natural capital:** includes the natural resource stocks from which products and services that are useful for livelihoods are derived.
2. **Physical capital:** comprises the basic infrastructure and producer goods needed to support livelihoods (e.g. shelter and buildings; tools and equipment used for farming or forest management; transport, energy and communications).
3. **Human capital:** includes the skills, knowledge, ability to work and level of health that people need to be able to pursue different livelihood strategies and achieve their objectives.
4. **Financial capital:** includes the financial resources that people use to achieve their livelihood objectives; they include savings in various forms, access to credit, earnings and remittances.
5. **Social capital:** refers to the social resources that people draw upon to help meet their livelihood objectives; these include networks and connections between people, and the rules, norms and sanctions associated with different institutions.



# Chapter 4

## Materials and methods



## 4.1 Study zone

Field work was conducted in the humid forest zone of Cameroon, located between 3°52' - 4°20' N and 11°57' - 12°30' E. This area lies within the Nyong-et-Mfoumou department in the Centre region of Cameroon. In 2000, the latter department had a population density of 20 persons per km<sup>2</sup> (Touna Ngono, 2005).

The villages studied were Epkwassong, Nyamvoudou, Ondeck, Loum, Abamyendjock, Ebassi and Omgbwang. Village geophysical and socio-economic characteristics are listed in Table 4.3 on p. 64.

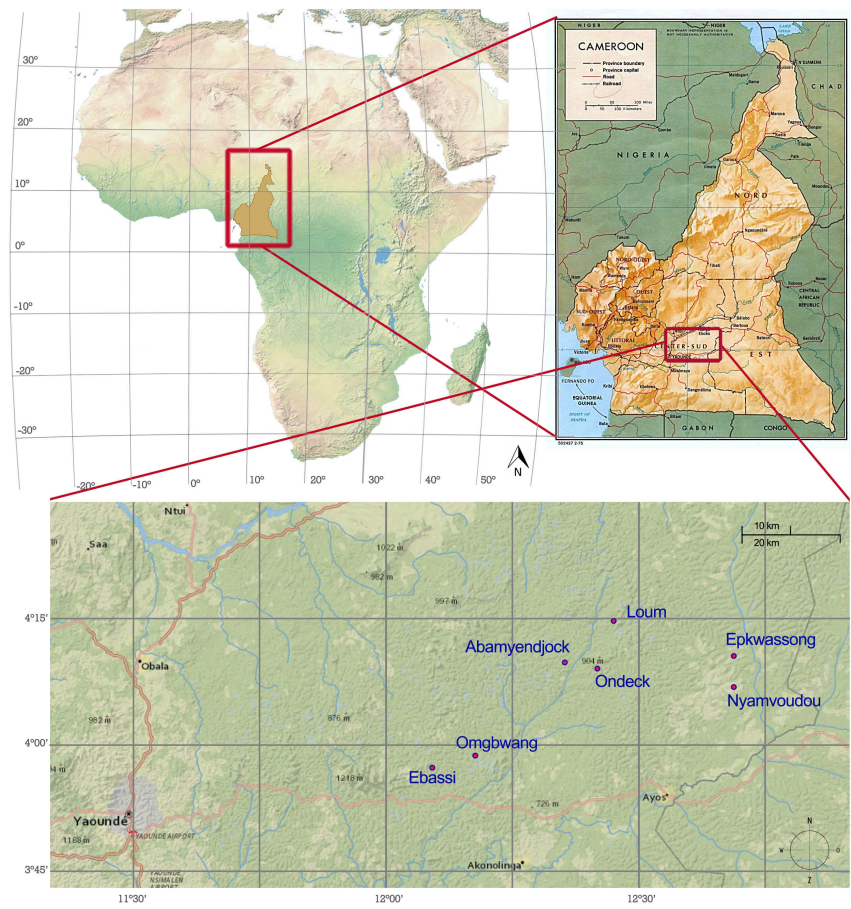
The region is characterized by a mean annual temperature of 25°C. Rainfall distribution is bimodal with an average between 1500-2000 mm year<sup>-1</sup>, with a first rainy season from mid-March to mid-July and another one from mid-August to mid-November (Fomete Nembot and Tchanou, 1998; Ayuk et al., 1999).

The vegetation in the study zone belongs to the forest of the Congo Basin, the Guineo-Congolian forest complex (White, 1983), the second largest area of moist evergreen forest in the world. In Cameroon, in 1985, 15,533,000 ha of this complex was still forested, which accounts for 30 % of the country's land surface [Sayer et al. (1996), based on vegetation maps of Letouzey, 1985]. More recent data of the FAO even states that 42 % of the land surface can be classified as forest (FAO, 2010).

Biogeographically, within the Guineo-Congolian forest complex, the study zone belongs to the lower Guinea forest, which stretches from Nigeria to the eastern border of Gabon. The forest of Lower Guinea appears to have the highest species richness of any vegetation type on the African continent [Thomas, 2004 cited by CBFP (2006)].

The forests in our study region belong to the Cameroon-Congolian forests. This complex covers 8,100,000 ha or 17.4% of Cameroon territory. And is the habitat of some characteristic species of the forest in the Congo Basin such as: *Lannea welwitschii*, *Cleistopholis patens*, *Xylopia staudtii*, *Bombax buonopozense*, *Cordia platythyrsa*, *Swartzia fistuloides*, *Irvingia grandifolia* and *Entandrophragma utile* (Sayer et al., 1996). Regarding forest exploitation in Cameroon, four tree species make up 63% of formal, not-illegal, exploitation: ayous (*Triplochiton scleroxylon*), sapelli (*Entandrophragma cylindricum*), tali (*Erythropheum ivorensis*) and azobé (*Lophira alata*) (de Wasseige et al., 2009).

Human activities have influenced the original vegetation in the study region. This created a mosaic of farmers' fallow-based cropping systems



**Figure 4.1:** Study area with villages studied [map based on National Geographic World Map (ArcGIS, 2012)]



**Figure 4.2:** Images of the study site; left: rural road in Ebassi; middle: slash-and-burn cultivation; right: *Theobroma cacao* plantation

and semi-permanent crop fields (Ayuk et al., 1999) with evergreen and semi-deciduous, primary and transition, moist humid forests (Sterculiaceae-Ulmaceae) [Letouzey, 1985 cited by Bidzanga and Ava, 2006].

Our study zone, located at a altitude of 650-750 m.a.s.l., forms part of the continental plateau in the humid forest zone of Cameroon which is situated between 500-1000 m.a.s.l. (Sayer et al., 1996). This area is located north of the Nyong river and belongs from a hydrological point of view to the Nyong's catchment area. In the area of Akonolinga, the Nyong's current is weak. The slope in this area is very low, about 1 m per 20 km (Touna Ngono, 2005).

The soils in the region are generally Ultisols and Oxisols, characterised by low base saturation and low cation exchange capacity (Ayuk et al., 1999).

## 4.2 Study sample descriptors

Table 4.1 lists socio-economic characteristics of the interviewed farmers. The data show that project and control households featured similar characteristics.

### Vulnerability context

The vulnerability context frames the external environment in which people live (DFID, 1999). People's livelihoods and the wider availability

### Box 4.1: General data of Cameroon

*'Paix Travail Patrie'*

The Republic of Cameroon is situated in western Africa. In the west, the country borders the Bight of Biafra, which is part of the Atlantic ocean. Neighbouring countries are Equatorial Guinea, Gabon and the Republic of the Congo (Congo-Brazzaville) in the south, Central African Republic in the east, Chad in the north-east and Nigeria in the north-west and west (Fig. 4.1). Cameroon covers a total area of 475,440 km<sup>2</sup>.

Independence:	1960
President:	Paul Biya (since 1982)
Currency:	Central African CFA franc (XAF)

Total population was estimated at 20.0 million in 2011 with an annual growth rate of 2.08% (World Bank, 2012). Cameroon is inhabited by various ethnic groups. The largest group are the Cameroon highlanders who represent 31% of the population. Other major groups are the Equatorial Bantu (19%), Kirdi (11%), Fulani (10%) and Northwestern Bantu (9%). Life expectancy was 52 years in 2011 (World Bank, 2012).

The official languages are both English and French. In addition to this, there are more than 200 local languages spoken. The latter can be classified in 24 major African language groups. While the people of the south and west have been profoundly influenced by Christianity, the people of the north are either Muslim or animist. They have largely retained their traditional modes of life. One other major contrast in the social geography of Cameroon is between the anglophone northwest and southwest Cameroon, and the much larger, more populated francophone area of former east Cameroon (Degrande, 2005).

**Box 4.1: Cameroon (continued)**

Cameroon has a rich and diversified, commodity-based economy. Agriculture was the sole engine of growth and foreign exchange earning until the late 1970s when oil became the primary source of income (Degrande, 2005). Because of its modest fossil oil resources and favourable agricultural conditions, Cameroon has one of the best-endowed, primary commodity economies in sub-Saharan Africa. Still, it faces many of the serious problems confronting underdeveloped countries, such as stagnant per capita income, a relatively inequitable distribution of income (Gini coefficient of Cameroon is 0.44), a top-heavy civil service, endemic corruption, and a generally unfavourable climate for business enterprise (CIA, 2012).

With forests and woodland covering nearly 48% of the country (de Wasseige et al., 2009), the forestry sector is the country’s second largest export earner after crude oil, generating around 20% of export revenues. Most agricultural production comes from smallholders, with the exception of rubber and oil palm, which are produced under a plantation system.

GDP (nominal):	\$25.46 billion	(2011 est.)
GDP (PPP):	\$47.3 billion	(2011 est.)
Annual growth GDP :	4%	(2011 est.)
GNI per capita (nominal):	\$1,210	(2011 est.)
GNI per capita (PPP):	\$2,360	(2011 est.)

Data from World Bank (2012)

Although the macro-economic context for Cameroon has improved over the last 2 decades, the county continues to suffer from severe poverty problems. Cameroon’s most recent household survey (ECAM III), undertaken in 2007, revealed that 39.9% of its population lived under the national poverty line, compared with 40.2% in 2001; 55% of the country’s poor people live in rural areas (IFAD, 2012). Cameroon has a low score of 0.482 on the Human Development Index (HDI) in 2011, ranking as number 150 on a total of 187 countries (UNDP, 2012). However, the HDI shows an increasing trend over the last 15 years.

**Table 4.1:** Characteristics of interviewed farmers in project and control villages (mean values  $\pm$  SD)

		Project households ( <i>n</i> =93)	Control households ( <i>n</i> =89)
<i>Age (year)</i>		48 $\pm$ 13	48 $\pm$ 14
<i>Gender*(%)</i>	<i>Male</i>	15	4
	<i>Female</i>	85	96
<i>Education level (%)</i>	<i>none</i>	6	5
	<i>primary</i>	59	70
	<i>secondary</i>	35	25
	<i>higher education</i>	0	0
<i>Education level spouse (%)</i>	<i>none</i>	2	5
	<i>primary</i>	59	56
	<i>secondary</i>	39	37
	<i>higher education</i>	0	2
<i>Experience njansang commercialization (year)</i>		10.6 $\pm$ 6	9.5 $\pm$ 7
<i>Number of children</i>		5 $\pm$ 4	4 $\pm$ 4
<i>Childrens' school attendance (%)</i>		71	63
<i>Number of persons for whom financially responsible</i>		7 $\pm$ 5	5 $\pm$ 5

\*significant difference between project and control households:  $p < 0.05$

of assets are fundamentally affected by a number of critical factors (population, resources, financial situation, governance, etc.), as well as by shocks (natural, economic, conflict, diseases, etc.), and seasonality (prices, production, employment opportunities, etc.), over which they have limited or no control. It is very important to acknowledge these issues as they often have a direct impact upon people's asset status and their options for livelihood strategies and related outcomes (DFID, 1999).

Our study zone lies within the humid forest zone of Cameroon. To understand the current situation and vulnerability context, we elucidate the history of this area and the major changes that occurred over time.

Before the 14th century AD, our study zone was covered with dense forest (Vansina, 1990). The few humans present were Pygmies and probably some early hunter-gatherers who did not practice any agriculture and were few in number (Diaw, 1997).

Based on ethnolinguistic dating, Vansina (1990) estimates that in the

14th or 15th century AD the expansion of the Ntumu-Ewondo-Bulu-Fang complex took place. The expansion had its cradle in the Sanaga valley in Cameroon and reached up to the shores of the Ntem and Woleu rivers in Gabon (encompassing our study area). It is with the early Bantu expansion that the movement to colonise the forest was initiated. This was to accelerate tremendously in the 19th century. It triggered a major reorganisation of the ethno-cultural landscape (Diaw, 1997).

Prior to German colonization, the humid forest zone of Cameroon was thus inhabited by Bantu forest people who had a semi-nomadic way of life (Diaw, 1997; Brown and Lassoie, 2010). People were grouped in clans which formed the basis of society whereby use of natural resources was strongly linked to them as well (Brown and Lassoie, 2010; van den Berg and Biesbrouck, 2000; Oyono, 2005). In those days, our study area was still covered by dense forest and people only opened up small areas for subsistence farming (Degrande, 2005). Anthropogenic impact on the forest was still limited due to low population densities and the people's semi-nomadic lifestyle (van den Berg and Biesbrouck, 2000).

A new era began when in 1884 Cameroon became a German protectorate. The colonial regime forbade in 1903 further migrations and forced people to settle along newly constructed roads (Diaw, 1997). Newly created villages often consisted of members from different clans. This caused the villages to be incoherent social units (Brown and Lassoie, 2010; van den Berg and Biesbrouck, 2000). This abruptly curtailed the ethno-cultural evolution and organization in the region (Diaw, 1997). Farms still consisted principally of growing groundnut (*Arachis hypogaea*), associated with maize (*Zea mays*), plantain (*Musa acuminata*) and cassava (*Manihot esculenta*) for home consumption. However, the prohibition of a semi-nomadic lifestyle, increased the pressure on forests around settlements, including a reduction of the fallow period. In addition, the Germans introduced some fruit trees such as mango (*Mangifera indica*) and citrus (*Citrus* spp.). They also introduced currently still important cash crops such as cocoa (*Theobroma cacao*) and coffee (*Coffea canephora*) (Degrande, 2005).

After World War I, the humid forest zone of Cameroon came under French authority. The French stimulated the cultivation of cocoa with the purpose of levying taxes (Degrande, 2005). Through cocoa crop intensification, many farmers had the opportunity to earn cash and entered the market economy.

In contrast to many other African countries, the revolution that ended in Cameroon's independence in 1960 (French part) did not cause major disturbances in people's livelihoods. During the following years, more than 80% of the population remained living in Cameroon's rural areas. Although



the rural population increased slowly, the urban consumer base was too small to render scale of food crops very attractive (Ndoye and Kaimowitz, 2000). Even in the Centre Province, where the largest food market of Yaoundé, was located, 76% of farmers' cash incomes came from cocoa in 1976, compared to only 11% from food crops (Alary et al., 1994). The main cash-generating activity in rural areas was the cultivation of cash crops for export. Over the next decade, the economy featured an annual growth of 5%, mainly related to rising cocoa and coffee exports, both due to increasing export quantities and international cocoa prices (Ndoye and Kaimowitz, 2000).

During this period, many primary schools were built in the rural areas. This changed life in the villages completely because children could go to a school close to home, leaving time to help their parents with farm work. It also significantly increased the number of children attending school (Degrande, 2005).

From 1977, a prosperous decade started with Cameroon's economy flourishing due to the discovery and export of petrol (Ndoye and Kaimowitz, 2000). During this oil boom, the country's economy grew each year with about 8.2%. Oil became the country's most important export product. Much of the oil income went to the public sector. The economic importance of agricultural products and cash crops also slightly benefited from the improved economic situation. Especially coffee production grew. Cocoa production seemed to stagnate despite the high international prices during this period and government subsidies for fertilizers and pesticides. This period was also characterised by a rapid migration from rural areas to the cities (Ndoye et al., 1997). Although this booming urban population should have stimulated food production in the humid forest zone of Cameroon, increased food import and government subsidies for food production in other regions caused food production in the humid forest zone to remain level (Ndoye and Kaimowitz, 2000).

In 1986, after a decade of abundance, a rapid decline in international coffee, cocoa and petroleum prices and the depletion of Cameroon's petroleum reserves, drove the country to a profound economic crisis. As a consequence, the national currency became overvalued, export collapsed and household incomes crashed. Initially, urban populations felt the crisis the hardest as, in rural areas, producer prices for cocoa and coffee were kept artificially high due to government subsidies. Nevertheless, at the beginning of the 1990s, all government support for cash crop-related activities was abolished, and cocoa and coffee markets were totally liberalized.

Finally, in 1994, the CFA franc zone nations devaluated their currency. In

order to cope with the crashed incomes from cash crops, farmers started to increase food crop cultivation. Urban demand for locally produced food increased as consumers lacked the finance to purchase imported products. In addition, the population in urban areas kept on rising although the rural-to-urban migration process tapered off (Ndoye and Kaimowitz, 2000).

To date, intensification of food crop production still continues, although cocoa prices have gone up again in recent years. This is unlike the situation for coffee where prices have remained very low (Degrande, 2005; ICCO International Cocoa Organization, 2012).

### **Livelihood strategies (Degrande, 2005)**

In the rural areas of Nyong-et-Mfoumou department, people pursue their livelihoods through agricultural activities in combination with hunting and gathering (Ndoye and Kaimowitz, 2000). Cropping systems consist of fallow-based food crop production (shifting cultivation), multistrata homegardens and semi-permanent, cash crop production (Ayuk et al., 1999).

Major food crops grown in the area include groundnut (*Arachis hypogaea*), cassava (*Manihot esculenta*), maize (*Zea mays*), yam (*Dioscorea* spp.), plantain (*Musa acuminata*) and cocoyam (*Colocasia esculenta*).

Livestock is of minor importance. In addition, people search for alternative sources of cash income which include commercialization of NTFPs (Ndoye and Kaimowitz, 2000; Brown and Lassoie, 2010).

Food crops are intercropped with several different legumes and vegetables on relatively small plots (< 0.5 ha). Short annual cropping periods of 1 to 3 years alternate with 2 to 15 years of fallow. The fallow period is normally required to restore soil fertility and reduce pests and diseases through self-regenerating, natural vegetation. In recent years, however, population densities have increased causing reduction in fallow length locally to 2 or 3 years, leading to an enormous degradation of the natural resource base.

The most important tree and cash crops are cocoa (*Theobroma cacao*) and coffee (*Coffea canephora*) and besides this, oil palm (*Elaeis guineensis*) and rubber (*Hevea brasiliensis*). Cash crops are usually cultivated as monocultures or agroforests with fruit trees, medicinal plants and high-value timber trees.

Farming in the forest zones of Cameroon is characterised by a strong annual periodic cycle which coincides with the area's bimodal precipitation pattern and crop production cycles. This creates peaks and slacks in labour



**Figure 4.3:** Products and activities related to farmer livelihoods in the humid forest zone of Cameroon; left: groundnuts; middle: farmer preparing fishing equipment; right: drying of green beans (*Phaseolus vulgaris*) and cocoa beans

demand. Tasks such as weeding and harvesting of food crops are very labour-demanding and generally do not allow for much flexibility. Therefore, the April-May-June period is the busiest for farm households. There is also a periodicity in food availability and food tend to be scarce during tiding-over period, when food reserves from the previous cropping season are finished and crops from the current season are not yet ready to be harvested.

Households in the humid forest zone of Cameroon are mostly self-sufficient all year round. However, many households go through short periods of food shortage prior to harvest and generally buy tubers and cereals in the months of March and April to cover household needs. In addition, the period of food scarcity coincides with the period of income scarcity, which increases the households' vulnerability. Households that can rely on non-agricultural cash revenues such as salary or pension, temporary jobs or trade are normally less affected during this period.

Degrande (2005) studied livelihood strategies in the humid forest zone of Cameroon in study sites with similar biophysical and socio-economic characteristics as the ones featured in our study. She distinguished five main livelihood strategies, which are applicable to our study area.

1. Cocoa/coffee-dominated. Households that generate their revenues mainly from 'traditional' cash crops, i.e. cocoa and coffee.

2. Cocoa/coffee + food crops. Households that generate an important part of their revenues from cocoa or coffee, but complement this income with the sale of food crop products.
3. Cocoa/coffee + market gardening. Households that generate an important part of their revenues from cocoa or coffee, but complement this income with revenues from market gardening (i.e. tomato, okra, maize, green vegetable).
4. Food crops dominant. Households that generate revenues mainly from food crops.
5. Non-agricultural. Households that generate their revenues mainly from non-agricultural activities, such as petty trade, pension, casual labour, etc.

Degrande (2005) found that in the forest zone of Cameroon, 37% of households combine cocoa and food crops to earn a living, whereas 24% rely on cocoa and 18% on food crops alone for the major part of their income. Fifteen percent of households obtain their main income from non-agricultural activities. Results obtained by Degrande (2005) confirm that farmers in southern Cameroon are integrated into food crop production. Whereas cocoa and coffee remain important income-generating crops, many households combine them with food crops to increase their revenues.

## 4.3 Sampling strategy

### Sample selection

The present study involves farmers active in commercialization of *Ricinodendron heudelotii* kernels (njansang). All households studied, collect and market these kernels.

The main methodological approach consisted in comparing households. We compared 1) households which had been participating in a marketing project promoting njansang commercialization, further referred to as 'project households'; with 2) households in neighbouring villages which had not participated in this marketing project, further referred to as 'control households'.

The marketing project referred to in this study, is called '*Increasing small-scale farmer benefits from agroforestry tree products in West and Central Africa - Short title: Agroforestry Tree Products for West/Central Africa (AFTP4A)*' project funded by the Belgian Development Cooperation (DGDC), and implemented by the World Agroforestry Centre (ICRAF) and partners from Jan 2009 - Dec 2012. In some of the project villages, the AFTP4A project was preceded by the Farmer Enterprise Development (FED) project which was funded by DGDC and ran from 2003-2007. AFTP4A built further on FED.

In our study region, which is located in the Nyong-et-Mfoumou department, the project aimed at promoting *R. heudelotii* domestication and commercialization of its kernels. We selected villages in the Nyong-et-Mfoumou department because here the project specifically concentrated on marketing *R. heudelotii* kernels and project interventions were well-advanced as compared to other villages in the Warm Humid Tropics zone of Cameroon.

Main project interventions of AFTP4A were:

1. facilitating institutional marketing arrangements by organizing farmers involved in njansang commercialization in producer groups, further referred to as njansang groups;
2. setting up of a market information system which had to provide njansang groups with up-to-date market and product price information in order to increase their bargaining power, and establish links between producers and traders;
3. technical support for product processing to reduce labour-intensive processing activities (still in test phase at time of research); and

4. the installation of village nurseries to stimulate the domestication process and planting of trees on farms.

At the time of this study, activities were still being facilitated by ICRAF and partners, but in the long term, njansang groups are supposed to become self-supporting.

A stratified sampling procedure was adopted. This stratification strategy corresponds directly with the study's main objectives. First, stratification was done at village level, based on presence or absence of marketing project. In our study zone, the Nyong-et-Mfoumou department, the three 'project villages' that had benefited from the marketing project were selected. Thus, we sampled all project villages in this department.

We then selected a 'control village' to match each project village. To select control villages, we took into account the guidelines of Andam et al. (2008). The latter state in their study, on the effect of protected areas on deforestation, that many authors performing impact studies do not control for bias which is introduced by differences in biophysical and socio-economic factors between target and control area. These differences in baseline characteristics can influence the value of the measured parameters and distort results. Andam et al. (2008, 2010) and Ferraro et al. (2011) correct for differences in observable biophysical and socio-economic factors by including a set of covariates and subsequently apply matching methods. These matching methods will give more weight to control samples (such as areas or villages) which have similar characteristics as the target samples. Hence, controls with strongly different biophysical and socio-economic characteristics will be almost excluded from the dataset.

In the present study, we incorporated characteristics of target and control villages right from the beginning as a basic element in selecting control villages. Only taking into account control villages with similar biophysical and socio-economic characteristics as those of target villages. This approach should yield a similar effect as in Andam et al.'s matching approach (2008, 2010) as described above. This approach limits our pool of control villages but ensures that we collect data which is comparable with the project villages. This will improve the usefulness of the data collected and results derived.

In practice, physical and socio-economic characteristics that are likely to influence njansang commercialization had to be similar in project and control villages in order to assume that, at the time before any project intervention occurred, control villages were similar to project villages, particularly with regard to njansang commercialization. Parameters that were taken into account in this study (Tables 4.2 and 4.3) have been found

### Box 4.2: AFTP4A

**What?** Research and development project led by the World Agroforestry Centre (ICRAF)

**Project title:** Increasing small-scale farmer benefits from agroforestry tree products in West and Central Africa. *Short title: Agroforestry Tree Products for West and Central Africa (AFTP4A)*

**Background:** The AFTP4A project builds on the Farmer Enterprise Development (FED) project in Cameroon which was funded by the Belgian Development Cooperation (DGDC) between January 2003 and December 2007. This project succeeded in training and empowering farmer households and farmer groups to market agroforestry tree products (AFTPs) through the development of viable marketing strategies and organizational arrangements.

**Donor:** Belgian Development Cooperation (DGDC)

**Executing institution:** World Agroforestry Centre: region West and Central Africa (ICRAF-AHT)

P.O Box 16317 Yaoundé, Cameroon  
Telephone: +237 22 21 50 84; Fax: +237 22 21 50 89  
icraf-aht@cgiar.org; <http://www.worldagroforestrycentre.org>

**Period:** January 2009 - December 2012

**Budget:** 3,667,072 €

**Location:**

Cameroon: Belo (North-West); Akonlinga, Mfou (Centre), Sangmelima, Ngoulamakong, Ebolowa (South), and Lomie (East).

Democratic Republic of Congo: Kasangulu, Mbanza-Ngungu (Bas-Congo), Tshopo district (Province Orientale).

### Box 4.2: AFTP4A (continued)

#### Target products

Cameroon: ndo'o (*Irvingia gabonensis*), njansang (*Ricinodendron heudelotii*), okok (*Gnetum africanum*), kola (*Cola* spp.) and safou (*Dacryodes edulis*).

Democratic Republic of Congo: fumbua (*Gnetum africanum*), safou (*Dacryodes edulis*), honey and anguto/bombi (*Anonidium mannii*).

**Goal:** increase, diversify and stabilise incomes of poor, small-scale farmers in West and Central Africa through increasing their participation in and benefits from agroforestry tree products value chains.

**Specific objectives:** develop viable socio-economic and environmentally sound value chains for selected agroforestry products by pursuing the following specific objectives, to:

- develop improved technologies and techniques for production, harvest and post-harvest of target products;
- develop effective organisational mechanisms and arrangements to strengthen linkages between actors in the respective AFTP value chains;
- establish a community-based market information system covering all target products;
- identify policy and institutional constraints and assess opportunities that facilitate the integration of poor farmers in AFTP value chains, including national and regional policy options that address these constraints; and
- compile research findings in training and extension materials and put in place effective strategies for dissemination of new technologies and mechanisms.



to strongly influence NTFP commercialization activities (e.g. Neumann and Hirsch, 2000; Marshall et al., 2006b), and tree domestication and plantation in the study area (Degrande et al., 2006). In addition, the parameters we used in our study were similar to the core ones used by Andam et al. (2008, 2010) (e.g. distance to main road, distance to city and access to natural resources) with the exception of some which were particular to the studies' objectives (e.g. presence of households commercializing njansang, village size, etc.).

NGO workers of ADEAC (Association for the Development of Farm Workers of the Centre) active in the region and working with ICRAF on the AFTP4A project, assisted in obtaining parameter' values. They participated in village selection because of their experience in and knowledge of the study zone and its settlements. Subsequently, ADEAC, ICRAF and the researchers together selected for each of the three project villages a nearby control village. Control villages were selected in the vicinity of each target village in order to limit variation in natural environment and other land use factors. On the other hand, control villages too close were not selected to prevent spillovers (Maredia, 2009).

**Table 4.2:** Socio-economic criteria used to select a control village for each project village

<i>Main criteria</i>	<i>Specifications</i>
<i>Market access</i>	<ul style="list-style-type: none"> <li>- Distance to urban market (physical and time distance)</li> <li>- (Seasonal) road accessibility</li> </ul>
<i>Njansang commercialization</i>	<ul style="list-style-type: none"> <li>- Presence of households marketing njansang (in 2005 and in 2010)</li> </ul>
<i>Access to njansang</i>	<ul style="list-style-type: none"> <li>- Occurrence of <i>R. heudelotii</i> in the region (tree density)</li> <li>- Farmer access to njansang</li> </ul>
<i>Village size</i>	<ul style="list-style-type: none"> <li>- Number of inhabitants per village</li> </ul>
<i>Cultural groups</i>	<ul style="list-style-type: none"> <li>- Ethnic groups, presence of immigrants</li> </ul>

The Ondeck-Loum njansang group split in 2010 during the research period. Because households in Loum had participated to a different degree in project interventions, Loum was considered as an additional project village. Households in Loum had received less capacity building sessions (see Table

6.1 on p 110) and had organized at that time less group sales. The main implication of this split was that we used the data from Abamyendjock as control data for both Loum and Ondeck. In addition, the sample of Loum was also quite small as a consequence of this unexpected event.

Subsequently, in each village, 30 households were randomly selected from all households active in njansang commercialization. During data collection, some households were removed from the sample group due to inconsistent responses during interviews, long-term absences or other unpredictable factors. These households were, as far as possible, replaced by others. After data cleaning, this resulted in a total household sample of  $n = 182$ . Sample size per village is displayed in Table 4.3.

The starting year of project interventions by ICRAF and partners differed between project villages (Table 4.3). Therefore, 2005 was chosen as reference year because it coincided with a period when the project was not active in any of the villages studied [with the exception of Epkwassong, where activities had started in 2000]. However, in 2005 the activities were still in a test phase and practical implementations were still in an early stage (as for example indicated by the absence of group sales)].

According to the classification of impact studies as mentioned in Maredia (2009); Baker (2000); Ravallion and van de Walle (2008), our research methodology can be labelled as a quasi-experimental design. It mainly relies on difference-in-difference methods (de Janvry et al., 2010) with baseline data collected using retrospective questions (Omilola, 2009). This means that we compared our target group with a control group. Through retrospective questions we took into account the time component. Next to this, we applied some single difference approaches (de Janvry et al., 2010).

Our methodological approach was selected based on our objectives and the recent evolutions in impact assessment (Fig. 3.2). In addition, we tried to take into account current guidelines and recommendations to assess impacts on rural development projects as formulated by de Janvry et al. (2010); Maredia (2009); Estrella et al. (2000) and IEG (2009) (see chapter 3; Table 3.1).

## 4.4 Data collection

Prior to data collection, some measures were taken to enhance data quality and minimize interviewer bias. This because the same data collection tools were used by different researchers. First, all data collection tools were screened by several experienced researchers (senior researchers from

Ghent University and ICRAF); tools were discussed and adapted when necessary. Next, the research team performing data collection (junior scientists who had studied at Ghent University, Belgium and Dschang University, Cameroon) sat together and went through the questionnaires and other data collection methods to ensure alignment and avoid differences in interpretation during data collection. Subsequently, data collection tools were tested in the field. Farmers participated in these exercises to ensure that terminology and language used was adapted to the interviewees. Finally, the research team discussed data collection tools once more and made adjustments based on preliminary field tests results.

In addition, during the entire data collection period, researchers met regularly, especially during the initial phase, to discuss results and deal with any issues of importance that surfaced during data collection.

Table 4.3: General information about the sampled villages

	Epkwassong		Nyamvoudou		Ondek		Loun		Abamyendjock		Ebassi		Ongbwang	
<i>Nearest city with urban market</i>	Akonolinga		Akonolinga		Akonolinga		Akonolinga		Akonolinga		Yaoundé		Yaoundé	
<i>Distance to urban market (km)</i>	96		90		61		80		56		60		65	
<i>ICRAF marketing project</i>	yes		no		yes		yes		no		yes		no	
<i>Year of 1st project intervention</i>	2003		-		2005		2009		-		2009		-	
<i>Membership of njansang group (number of households, 2010)</i>	86		-		56		25		-		35		-	
<i>Year of 1<sup>st</sup> group sale</i>	2005		-		2005		2009		-		2009		-	
<i>Sampled households (n)</i>	26		31		26		15		30		26		28	
<i>Coverage of total households commercializing njansang (%)</i>	30		19		14		25		19		64		64	
<i>Total number of households in the village (focus group estimate)</i>	87		400		200		62		188		80		44	
<i>Ethnic groups</i>	Essanvang, Yeyen, Essibonda		Yebokolo		Yebokolo, Oveng, Yebesso		Yebokolo, Oveng		Yendjock		Yendjock, Yengono, Mbogdjom		Yendjock, Yengono, Yedouma	

## Data collection period

Data of njansang activities were collected on a continuous basis during June 2010-September 2011 period (see chapter 7). All other data were collected during October-November 2010 and July-August 2011.

In the October-November 2010 period, data was collected by a three-persons research team. During this period, each of the seven villages was visited for a period of seven consecutive days whereby researchers resided in the village. This increased mutual respect and an atmosphere of trust between farmers and researchers which were assumed to have a positive influence on the reliability of the collected data. It also created valuable informal moments in which information was exchanged providing researchers qualitative data and with a more holistic view on farmers' livelihoods and the changes that had occurred over the 2005-2010 period.

In the July-August 2011 period, a similar approach was used. During this period, a group of six researchers was involved. After aligning methods and field protocols, the group split into two small groups of three persons to assess different villages.

## Data collection methods

Our study measures the socio-economic impact of a development project on farmers' livelihoods. This requires a multi-dimensional perspective (van Rijn et al., 2012b; Ashley and Hussein, 2000; DFID, 1999). As elaborated in section 3.2, we selected the Sustainable Livelihood Framework (SLF). Figure 4.4 represents the expected impact pathway of the project interventions on farmers' livelihoods.

To study the complex interaction of people and natural resources, and in order to assess the multiple facets and indicators embedded in SLF, we relied on a combination of quantitative and qualitative information as suggested by Neumann and Hirsch (2000), Schreckenberg et al. (2005), Leeuw and Vaessen (2009) and Malleson et al. (2008). The different indicators will be described and discussed in the respective chapters.

We investigated all 5 types of assets of the SLF separately (financial, social, natural, human and physical). However, the changes induced by project interventions on farmers' physical assets were negligible. Because of that we will not dedicate a separate chapter to this asset, as is the case for the other assets, but it results will be present in the overall analysis in chapter 9.

According to our objectives, different methods for data collection were applied as presented in Table 4.4.

**Table 4.4:** The different methodologies as used to study the different aspects of farmer livelihoods in the research chapters in this thesis

Data collection methods	Livelihood assets					
	Financial	Natural	Physical	Human	Social	All assets
Semi-structured household questionnaires	v	v	v	v	v	v
Interviews with key informers	v	v	v	v	v	v
Focus group discussions	v	v	v	v	v	v
Wealth-ranking exercises	v	o	o	o	o	v
Participatory tree inventories	o	v	o	o	o	v
Weekly structured questionnaires	o	v	o	o	o	v

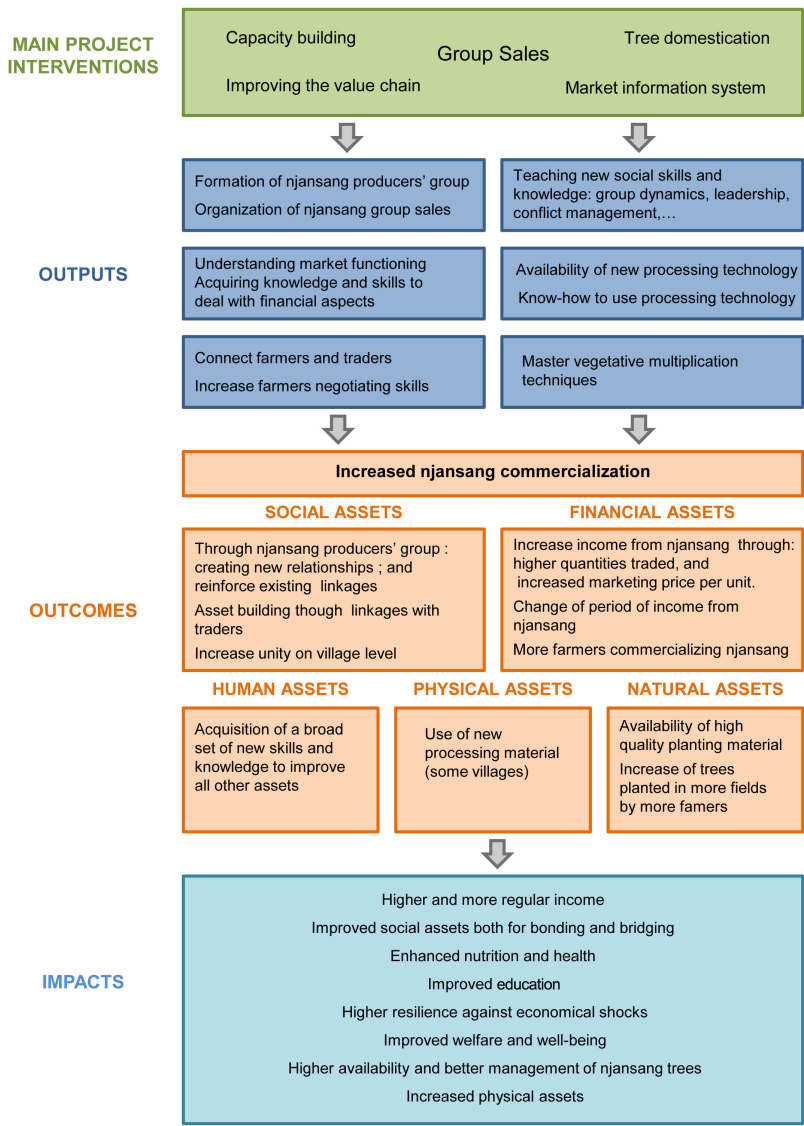
v: used; o: not used

Data collection methods will now be briefly discussed and further elucidated in the corresponding chapters. In general, development of methodological approaches was based on guidelines provided by Marshall et al. (2006a), Campbell and Luckert (2002) and Schreckenberg et al. (2005). The core of the data was collected on household level which is considered to provide *‘the most reliable comparative indicators of human welfare’* (Andam et al., 2010).

**Semi-structured household questionnaires**

Semi-structured household questionnaires contained questions on multiple livelihood assets following the guidelines of Grosh and Glewwe (2000) and Schaeffer and Presser (2003). Researchers performed face-to-face interviews in 2010 and 2011. Within households, the household member most involved in njansang commercialization activities was interviewed. During the interview, other household members were sometimes asked to provide additional information on subjects the interviewee was less familiar with. Very personal questions, concerning development of self-esteem and autonomy, were asked without the presence of anyone else.

Questionnaires were written in French, which was the dominant communication language between interviewer and interviewee. In some cases, the local language (Ewondo and related dialects) was used. These interviews were generally done by a researcher who mastered the language



**Figure 4.4:** The simplified impact pathway of the AFTP4A project and its assumed impact on farmer livelihoods

or, in a few cases, facilitated through a third person from the village who operated as translator.

### **Interviews with key informers**

Interviews were based on open-question questionnaire. Questions were used as guideline for conversation but the main approach was to let farmers talk freely. Key informers were selected following the guidelines of Marshall et al. (2006a). In each village, a minimum of three key informers were scheduled to be interviewed, but in practice many more farmers operated as key-informers during the many informal conversations during data collection. The information collected from key informers made the researcher better understand farmers' livelihoods and helped to formulate and improve questionnaires.

### **Focus group discussion**

A focus group discussion was organised in every village both in 2010 and 2011, following the guidelines of Marshall et al. (2006a). We aimed at a participation rate of women of at least 75% or higher because njansang was mainly collected and commercialized by women (4.1).

In 2010, on average 10 to 12 farmers attended each focus group discussion. During the 2010 session, general characteristics of the villages and njansang activities were assessed by:

- drawing a village map (showing different land use systems, distance to neighbouring villages and main roads, location of households, churches, rivers, etc.);
- discussing common arbocultural practices related to *R. heudelotii*;
- explaining use of *R. heudelotii* by past generations and linking this to the trees' current distribution in the fields;
- discussing in which land use system or habitat *R. heudelotii* occurs and the trees' effects on agricultural activities;
- presenting customary management systems for njansang and possible quarrels between farmers related to njansang exploitation;
- discussing domestication of *R. heudelotii*, and access to and use of planting material;
- assessing main impacts of ICRAF's interventions (only for project villages); and



- discussing the influence of gender on aspects of njansang commercialization.

The information derived from focus group discussions was used to increase general understanding of njansang activities within a village: this helped to understand and frame farmers' answers during interviews. It further helped to improve questions for household surveys in 2011, whereas the information was used throughout the study to frame and discuss the observed quantitative study results.

In 2011, focus group discussions involved 4 to 6 persons with experience in njansang commercialization. Discussions focused on participants' vision of successful njansang commercialization. In addition, participants were asked to indicate the importance of njansang commercialization in providing different livelihood outcomes. During these sessions, changes between 2005 and 2010 in livelihood outcomes and impacts of the project's interventions were also assessed (see chapter 9).

### **Wealth-ranking exercises**

Wealth-ranking exercises provided information on the wealth status of households in a particular village. The main purpose was to obtain a wealth score for each of the households sampled. Households' wealth scores were used for income analysis in chapter 5.

The exercise was conducted in each village with four farmers separately. We selected farmers who were familiar with all the households in the village. To avoid selection bias, stratification of the selected farmers occurred based on gender (generally two females and two males) and wealth status (including both less-wealthy and wealthy farmers).

Five wealth classes were distinguished: 1) poorest; 2) poor; 3) average; 4) rich; and 5) richest. It was explicitly mentioned to farmers that this was a relative scale, and that in each village there were households that were the poorest while other households were the richest.

The exercise involved four steps:

1. farmers' representation of wealth indicators;
2. grouping the households commercializing njansang over five wealth classes;
3. explaining general characteristics of each class; and
4. final revision and possible reclassification of each household.

Next, based on the four different classifications, an average household wealth score was calculated. Subsequently, based on these scores, farmers in each village were divided again into three wealth groups (wealth score: 1)  $<1.5$ ; 2)  $>1.5$  and  $<3$ ; 3)  $>3$ ) Both, wealth score and wealth groups classification were linked to njansang incomes in chapter 5.

### **Participatory tree inventories and periodic structured questionnaires**

See chapter 7.

## **4.5 Methodological approaches used in the present thesis and their implications**

### **4.5.1 Baseline study**

The main weakness of this study is the lack of a baseline study for comparison. No data was available for the year 2005, representing the period before project interventions started. Hence, data of 2005 had to be collected using retrospective questions which implied that there were many uncertainties and problems of accuracy (Bernard et al., 1984). De Janvry et al. (2010) state that retrospective data are likely to result in substantial measurement errors. Nonetheless, we took particular measures were taken to obtain representative data.

First of all we used control groups. This enabled us to perform difference-in-difference analysis rather than single difference approaches. In addition to common approaches to assess quantities (eg. njansang collected, processed or marketed) rating exercises were chosen which relied on relative rather than absolute quantities and seemed easier to grasp by farmers as no concrete figures had to be recalled. Furthermore, we cross-checked the indicators of main importance (such as change in njansang income) by assessing them multiple times through different indicators using different data collection approaches. Moreover, different data collection approaches yielded similar results which strengthened the results' validity.

### **4.5.2 Time period**

With regard to impact evaluation, the time over which certain changes are observed will strongly influence the results obtained (de Janvry et al., 2010). Many development projects are limited in time and often only have a 3- to 5-year funding span. In our study, a 5-year period was evaluated. Similar time frames were used by other authors. For instance van Rijn et al. (2012b) who

assessed impact over a period of 5 years of a project increasing coffee quality in Peru. Opposed to this, Andam et al. (2010) assessed in their study on the relation between poverty alleviation and the presence of protected parks, a period of 15 years and called this an evaluation of 'longer-term impacts'. In comparison to other studies, we assessed in our study short-term changes.

Although some impacts are readily measurable over the applied 5-year period, for other changes this time frame is too short (de Janvry et al., 2010). For biological indicators, for example, there often occur substantial time lags between an anthropogenic activity and its effects on these indicators (Salafsky and Margoluis, 1999). In addition, many biological indicators such as population of a given species or nutrient levels in a stream, have naturally occurring fluctuations that render it difficult to interpret short-term changes (Salafsky and Margoluis, 1999).

Hence, in our study we tried to focus on indicators which were assumed to be measurably influenced over a short, 5-year time frame.

Another limitation of the present study is that, for most analyses, we pooled data of villages where projects had been set up for only a year with data of villages where the project had been ongoing for 5 years. This implies that we did not measure the effect of project interventions over a 5-year period, but rather a mix of the changes occurring over a short period of time. However, some indicators were analysed per village and the relation between time and indicator change was also partially studied.

### **4.5.3 Selection of counterfactual**

One of the main challenges of modern impact assessment is to establish a proper control group for comparison (de Janvry et al., 2010; Maredia, 2009). Thus, to select a proper group to compare with so-called 'adopters' (in our case adopters are households engaging in development project activities). Mainly because the impact on adopters differs from the impact on non-adopters, the control group should actually consist of 'future' adopters (de Janvry et al., 2010). But, who adopts and who doesn't?

De Janvry et al. (2010) state that it is unlikely that many of the important determinants of adoption could be evidenced or quantified even if significant monetary resources were available to the researcher. For instance, it is quite a challenge to grasp aspects such as a person's entrepreneurial skills and psychological characteristics.

In the present study, the selection of control households with regards to personal skills and characteristics did not seem to be problematic. All control

households commercializing njansang could be seen as possible adopters as results from project villages showed that all farmers commercializing njansang got involved in the project over time (Table 4.3).

Village selection did possibly introduce some bias. Although villages were selected based on similarity in socio-economic environment characteristics, on the field it seemed that control villages were slightly different as compared to project villages. In general, the connection between the villages and the main trade markets (Yaoundé or Akonolinga) was better in control villages. The control villages Nyamvoudou and Abamyendjock, had a physically more accessible road than their respective project villages. In the case of Omgbwang, physical accessibility was similar to the control village Ebassi, but the road through Omgbwang was more frequented by traders as it was an access road to other villages and cities (focus group discussion). Hence, in the present study we mainly focused on differences in changes over the 2005-2010 period rather than on differences between project and control villages in 2005 or 2010.

The problems of selection bias could have been partly prevented by focusing more on a better selection of control villages. After initial selection of control villages, a small preliminary study could be performed to determine the suitability of the villages initially considered. In studies related to product commercialization and value chains, distance to a main road and distinguishing between different classes of earth roads could decrease selection bias. Nonetheless, finding in real-life conditions the perfect counterfactual without any bias whatsoever remains elusive (de Janvry et al., 2010).

#### 4.5.4 Spillovers

Another problem related to the selection of counterfactuals are spillovers. Spillovers complicate the search for counterfactuals, because true counterfactuals should not be affected in any way by project households (de Janvry et al., 2010). This is why it is advised to select controls in a village other than the one where interventions take place (de Janvry et al., 2010). On the one hand, working in different villages will greatly reduce the problem of spillovers, but, on the other hand, this increases the risk of selection bias due to different socio-economic conditions in the control village as compared to the project village.

In our study, control villages were selected in the vicinity of project villages in order to minimize socio-economic differences between villages. This increased, however, the risk of spillovers. Nonetheless, farmers in control villages did not know what happened in the project villages. Although

they knew something was going on, they did not know the details and had not adopted any of the techniques applied in project villages. Thus, it seemed that project interventions did not significantly influence njansang commercialization activities and approaches in controls. This was also confirmed by control households during focus group discussions.

We recommend for future research to maintain distances between target and control villages large enough ( $< 20$  km) while also checking for possible links between communities. In addition, geographic and socio-economic isolation should be similar in project and control villages and the latter should not have had more contact with the development organization under review than strictly necessary.

#### **4.5.5 Responders' reliability**

The reliability of data obtained through semi-structured questionnaires, participatory tree inventories and other participatory approaches should be critically approached. Although farmers can provide reliable data applying semi-structured questionnaires (Jones et al., 2008), bias could have been introduced due to different perspectives of project and control farmers (White and Phillips, 2012).

On the one hand, control farmers were not engaged with the development organization and the idea of possible future cooperation could have influenced respondents answers.

On the other hand, project farmers might also have had reasons to withhold some information. Some might have exaggerated the results to demonstrate the positive effect of the project (especially in recently included villages) while others might have underestimated some effects out of fear the project would leave (e.g. in Epkwassong, see p. 102).

However, it is impossible to account for these possibly biased answers and we assume individual farmers' exaggerations or underestimations balanced each other out. Nonetheless, interviewers explained clearly the objectives of their presence and those of the study in order to decrease bias. In addition, sample size was taken as large as possible.



# Chapter 5

## Financial assets

### Can commercialization of *Ricinodendron heudelotii* kernels alleviate poverty?



Published as:

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## Abstract

*Ricinodendron heudelotii* (Baill.) Pierre ex Pax. kernel (njansang) commercialization has been promoted by the World Agroforestry Centre (ICRAF) in project villages in Cameroon with the aim to alleviate poverty for small-scale farmers. We evaluated to what extent development interventions improved the financial situation of households by comparing project and control households. The financial importance of njansang to household livelihoods between 2005 and 2010 was investigated through semi-structured questionnaires with retrospective questions, focus group discussions, interviews and wealth-ranking exercises. The importance of njansang increased strongly in the entire study region and the increase was significantly larger in project households. Moreover, absolute numbers of income from njansang commercialization as well as relative importance of njansang in total cash income, increased significantly more in project households ( $p < 0.05$ ). Although the lower wealth class households could increase their income through njansang trade, the upper wealth class households benefited more from the projects' interventions. Group sales as conducted in project villages did not lead to significantly higher prices and should be reconsidered. Hence, promotion of njansang had a positive effect on total cash income and can still be improved. The corporate actors for njansang commercialization are encouraged to adapt their strategies to ensure that also the lower wealth class households benefit from the conducted project interventions. In this respect, frequent project monitoring and impact analysis are important tools to accomplish this adaptation.



## 5.1 Introduction

Non-Timber Forest Products (NTFPs) have been harvested for subsistence and trade for thousands of years and their importance has been demonstrated by various authors (Neumann and Hirsch, 2000; Marshall et al., 2006b). They have proven to be of great value for rural communities in their daily diet as well as providing cash income that allows them to cope with their daily financial needs (Pimentel et al., 1997).

The importance of NTFPs has never been questioned, but the real boost came after the United Nations Conference on Environment and Development (UNCED) in Rio in 1992 where the potential of NTFPs and their commercialization for sustainable development was officially acknowledged. NTFPs have been widely promoted ever since. Commercialization of NTFPs has the potential to combine economic and ecologic benefits (Neumann and Hirsch, 2000); it can enhance economic development and alleviate poverty in combination with the conservation of natural ecosystems (Arnold and Ruiz Pérez, 1996).

Tieguhong et al. (2009) stated that livelihoods of farmers can be improved by assisting local communities to commercialize NTFPs. According to the latter authors, local support should improve institutional arrangements, promote the implementation of available policies, improve technologies and transport infrastructure for processing and marketing, and enhance information flows.

Against this background, numerous projects to promote the commercialization of NTFPs have been supported by national and international non-governmental and governmental organizations (Neumann and Hirsch, 2000). Although promotion of NTFP commercialization seemed, in theory, straightforward, in practice, it turned out to be a challenge (Belcher and Schreckenberg, 2007). Several drawbacks and obstacles were encountered and many projects did not deliver the expected outcomes and successes (Neumann and Hirsch, 2000). Hence, the impacts of development projects that focus on NTFP commercialization need to be evaluated properly. External organizations and funders, who want to be informed about the actual changes resulting from their financial inputs, are interested in thorough impact assessments (Maredia, 2009). There is still a lack of reliable data on the impact of development programs. As a consequence, the measuring methods and analysis used have remained almost purely theoretical (Savedoff et al., 2006; Maredia, 2009). The impact of NTFP commercialization on farmers' livelihoods in particular has rarely been assessed or documented in literature, with the exception of a few studies from Latin America (Marshall et al., 2006b).

In Cameroon, development and research organizations promote the commercialization of NTFPs. One of the most important NTFPs in the country, as recognized by farmers, are the kernels of *Ricinodendron heudelotii* (Baill.) Pierre ex Pax., locally known as njansang (Mollet et al., 1995; Plenderleith, 2004). More info on *R. heudelotii* can be found in chapter 2.

Our main aim for this chapter is to evaluate the impact of the AFTP4A project on farmers' financial situation (see chapter 4). Our objectives are to investigate the change, over the 2005-2010 period, of 1) the absolute and relative income from njansang commercialization; 2) quantities of njansang commercialized and prices received; and 3) how income from njansang commercialization is spent. In addition, the so called gap-filling character of njansang income is studied. Finally, the study also investigates to what extent the poorest households benefited from the project interventions in 2005 and 2010.

## 5.2 Materials and methods

Data were collected from October to November 2010. Within each village, households involved in njansang commercialization were randomly selected from all households active in this NTFP's commercialization. A total of 158 households within six villages was thus studied. At household level, data were collected using semi-structured questionnaires. Household financial data were collected using retrospective methods following guidelines from Cavendish (2002) and Omilola (2009). Questions focused on two production years, namely 2005 and 2010, whereby the first represents the era before any project intervention.

Change in household's income, that was derived through marketing njansang between 2005 and 2010, was evidenced applying three methods: 1) using absolute income data from njansang sales; 2) calculating relative importance of njansang in total cash income; and 3) a self-evaluation by the respective farmers on the change of income derived from njansang over this period.

Absolute income data were calculated from quantities sold and prices attained in 2005 and 2010. Additionally, the type of commercialization technique each household used during each of these two years was recorded (see below).

Relative importance of njansang for total cash income was calculated using a

weighing approach as described by Termote et al. (2010, 2011). Farmers first summed up their cash-generating activities. Subsequently, they quantified the contribution of each activity to household's total cash income by assigning a weight to them. Weights were indicated using a total of 40 items (nuts or small stones) which had to be distributed. This exercise was done for cash incomes for both 2005 and 2010.

For the third measure, farmers had to self-evaluate the change in njansang income between 2005 and 2010 on a 5-point Likert-item. The scores on the Likert-item went from -2: a large decrease, over -1: decrease, 0: no change, 1: increase, to +2: a large increase. On a Likert-item with the same values farmers self-evaluated the change in total cash income over the observed time frame. Data on njansang production costs, quantities, commercialization periods and prices were also collected from semi-structured household interviews, again pertaining to 2005 and 2010.

Data were collected on how incomes from njansang commercialization were spent. To this end, a weighing exercise was applied (Termote et al., 2010, 2011). First, interviewees summed up the expenditure classes that njansang incomes were used for. Next, they were provided with 50 items (nuts or small stones) which they were requested to distribute over these expenditure classes according to the relative amount of njansang income which was used for each expenditure class.

Additional data were collected using participatory approaches at village level following the guidelines from Schreckenberg et al. (2005). More specifically, focus group discussions and interviews with key informers focused on trends and changes within the village which were attributed to njansang commercialization, while participatory wealth ranking provided information about the wealth status of households (see section 4.4). Wealth ranking exercises are a common tool in rapid rural appraisal (RRA) (Sontheimer et al., 2013).

In addition to establishing a household classification in wealth groups, four farmers performed a weighing exercise to establish the relation between wealth in the village and involvement in njansang commercialization. First, farmers received 40 items which represented all households of the village. These items had to be distributed over the five wealth classes according to their relative occurrence in the village (more info on wealth classes is on p. 69). Thus, if many poor households lived in the village, this group would receive more items. Next, the same exercise was used to study the wealth and poverty of households commercializing njansang, but now the 40 items represented only the households involved in njansang commercialization. Combining the two exercises provided an indication about the relative

wealth of households involved in njansang commercialization.

### Data analysis

Statistical data analysis was conducted with SPSS Statistics 17.0. Preconditions to perform a parametric tests were not met so that all statistical tests were non-parametric. Household data of project villages were pooled and tested against pooled household data from control villages. Another approach of data pooling was based on the types of household commercialization techniques which depended upon the location of product trading and trading practices (if the product was traded individually or in a group). Here, four trading practices were distinguished: 1) individual trade at home; 2) group trade at home; 3) individual trading at a market outside the village; and 4) a combination of 2) and 3).

Households' wealth ranking scores that were obtained during the wealth ranking exercises, were used for our wealth analysis. Based on household ranks according to their wealth scores gathered in 2010, the latter were divided in three groups, namely: 1) lower; 2) middle; and 3) upper wealth class.

Local units to measure njansang quantities, such as cups or glasses provided volumetric data which were converted to kilograms by weighing the different recipients. The latter were weighted both empty and filled with njansang, the way they were filled as when the product was sold. These quantity data are assumed to contain minor measurement errors due to the variation in local units used by traders and farmers during njansang trade.

The change of absolute income from njansang commercialization between 2005 and 2010 yielded continuous data. For comparison with farmers' self-evaluation of their income evolution, these data were reduced to nominal data by grouping them into six groups: 1) negative change of income; 2) positive change: less than 1 dollar (USD, \$)  $\text{day}^{-1}$ ; 3) less than 2 \$  $\text{day}^{-1}$ ; 4) less than 5 \$  $\text{day}^{-1}$ ; 5) less than 10 \$  $\text{day}^{-1}$ ; and 6) more than 10 \$  $\text{day}^{-1}$ .

To compare data from 2005 and 2010, current values were calculated for absolute income and price data with 2010 as reference year. The applied inflation rate was based on the mean annual inflation rate in Cameroon between 2005 and 2010, namely 2.56%. Data from 2005 were recalculated accordingly. A currency exchange rate of 1 dollar (USD) to 468 FCFA (XAF) was applied (06-03-2011).

To study the gap-filling character of njansang incomes, we studied the relative monthly cash income of all household's activities. For the figures on

household cash-generating activities (besides njansang commercialization), we relied on the results of Mbosso (2007) who performed a socio-economic study on the evolution of njansang commercialization in Epkwassong, one of the project villages in our study. Mbosso (2007) quantified the periodicity of main sources of cash income. Hence, through Mbosso (2007), we possessed data on relative contribution of all cash-generating activities during each month. This was combined, through a simple multiplication process, with the average importance of each activity to households' total cash income, as found in our study (see Fig. 5.4). This resulted in figures on households' relative monthly cash income, which were compared between project and control households.

## 5.3 Results

### 5.3.1 Absolute njansang income

Absolute income from *R. heudelotii* was characterized by a large variability between households (Table 5.1). In 2010, njansang revenues per household per year ranged between 2 and 860 USD, while 50% of households earned between 30 and 108 USD. Incomes in 2010 were significantly higher than those in 2005 for both project and control households (Wilcoxon signed-rank test,  $n = 86$ :  $p = 0.002$  resp.  $n = 81$ :  $p = 0.019$ ). However, income increase of project households was significantly larger than those of control households (Mann-Whitney test,  $n = 167$ :  $p = 0.049$ ). Nevertheless, neither in 2005, nor in 2010 there was any significant difference in absolute njansang income between project and control households.

### 5.3.2 Relative importance of njansang commercialization

In 2010, at least 70% of households in each village were involved in njansang commercialization. In 2005, njansang commercialization used to be less common in all villages, especially in project villages where only a few households had been involved in this activity (Table 5.2).

In 2005, the relative importance of njansang for total cash income was significantly lower in project households than in control households (Table 5.3). In 2010, there was no difference between project and control households, while in both sets of villages relative importance of njansang increased to about 20% of total cash income. Thus, a significant increase in financial importance of *R. heudelotii* kernels was observed in both project

**Table 5.1:** Annual absolute household income (USD) from njansang commercialization in project and control households (2005 and 2010)

	<i>Project households</i>	<i>Control households</i>
<i>Median 2005*</i>	36.7 <sup>a</sup>	41.6 <sup>a</sup>
<i>Middle 50% (between quantiles 1/3) (USD)</i>	14.7-117.3	19.6 - 97.8
<i>Median 2010*</i>	73.3 <sup>a</sup>	61.0 <sup>a</sup>
<i>Middle 50% (between quantiles 1/3)</i>	40.5-123.9	31.3 - 93.8
<i>Median change 2005-2010*</i>	21.9 <sup>a</sup>	18.6 <sup>b</sup>

\* Different superscripts indicate significant differences within rows, Mann-Whitney tests, n = 167

**Table 5.2:** Percentage of project and control households involved in the commercialization of *R. heudelotii* kernels (2005 and 2010)

	<i>Mean 2005 (%)</i>	<i>SD* (%)</i>	<i>Mean 2010 (%)</i>	<i>SD* (%)</i>
<i>Project villages (n = 4)</i>	30	20.0	93	21.5
<i>Control villages (n = 3)</i>	73	25.1	83	15.3

\* Standard Deviation

and control households, although the increase for project households was significantly higher than for control households.

If we would only rely on absolute parameter values in 2010, differences between project and control villages and households would appear to be very small. This gives a distorted image of the actual occurred change in the 2005-2010 period. Therefore, we take into account that in 2005 the degree of involvement into the njansang value chain differed between project and control households and focus further in our study on changes of parameter values in the 2005-2010 period.

With the exception of Omgbwang, all villages showed a significant increase in relative importance of njansang earnings to total household income (Table 5.3).

**Table 5.3:** Relative importance of njansang commercialization to households’ total cash income in 2005 and 2010. Data were pooled between project and control households, and subsequently between project village and respective control village.

	Median 2005 (%)	<i>p</i> <sup>*</sup>	Median 2010 (%)	<i>p</i> <sup>*</sup>	Median change 2005-2010 (%)	<i>p</i> <sup>**</sup> ( <i>H</i> <sub>0</sub> = 0)	<i>p</i> <sup>*</sup>
<i>Project households</i> <sup>a</sup>	12.4	0.019	21.1	0.810	8.9	<0.001	0.045
<i>Control households</i> <sup>a</sup>	15.0		20.0		5.0	<0.001	
<i>Epkwassong n=26</i>	5.0	0.031	19.8	1.000	14.0	<0.001	0.011
<i>Nyamvoudou n=29</i>	15.0		20.0		5.0	0.019	
<i>Ondeck n=17</i>	5.0	0.172	16.0	0.144	12.1	0.005	0.036
<i>Abamyendjock n=30</i>	10.0		15.0		5.1	<0.001	
<i>Ebassi n=27</i>	15.0	0.001	20.0	0.036	2.7	0.014	0.033
<i>Omgbwang n=23</i>	24.0		23.1		0.0	0.287	

<sup>a</sup> total n = 167; <sup>\*</sup> Mann-Whitney tests; <sup>\*\*</sup> Wilcoxon signed-rank test

5.3.3 Households’ self-evaluation of income changes

The households’ self-evaluation of yearly income from njansang commercialization on a 5-point Likert-item showed a more pronounced trend. Project households had mean scores of 1.16, with 1 indicating an ‘increase’ and 2 a ‘large increase’. Control households featured a significantly lower mean score (0.46; Mann-Whitney test, n = 163: p <0.001). Only 10% of project households yielded a score of zero or below, indicating ‘no change’ or a ‘decrease’ in njansang income. In control villages, 28% perceived ‘no change’ and 17% a negative change. Project households clearly indicated that their income from *R. heudelotii* kernels sales had increased between 2005 and 2010, while the larger standard deviations indicated that opinions of respondents from control villages diverged.

A self-evaluation of the households’ total yearly income was also done on a 5-point Likert-item. A small but significant (Wilcoxon signed-rank test, n = 163: p <0.001) positive trend between 2005 and 2010 was observed for both project and control households with mean scores of 0.70 and 0.32, respectively. However, comparing these values between both groups did not show significant differences. Spearman rank correlations within project (r = 0.52) and control households (r = 0.59) (Spearman’s correlation, n = 156: p <0.001), revealed a positive relationship between self-evaluation of total income and self-evaluation of njansang income. In

control villages, 57% of households linked their increased income to the commercialization of *R. heudelotii* kernels. In project villages, 90% of households made this connection between income increase and improved product commercialization.

The self-evaluation results of the change perceptions in njansang income were compared to two more objective parameters which were previously discussed: change in absolute data from njansang income and change in proportion of njansang income to total cash income. All parameters were significantly correlated (Table 5.4). Correlations involving self-evaluation of njansang income were, however, lower for project than for control households.

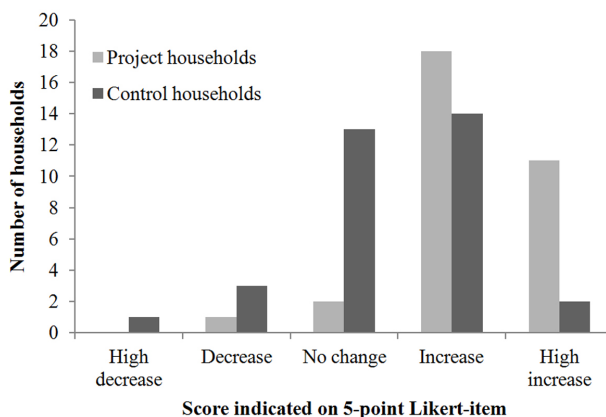
**Table 5.4:** Spearman rank correlations between three different measures of households’ income evolution between 2005 and 2010 from njansang in project and control households

	<i>Change absolute income</i>		<i>Change relative importance income</i>	
<i>Change relative importance income</i>	Project:	0.34**	n=160	
	Control:	0.27*		
<i>Self-evaluation evaluated on Likert-item</i>	Project:	0.26*	n=167	Project: 0.24*
	Control:	0.42***		Control: 0.41***

significant on the: \*0.05-level, \*\*0.01-level, \*\*\* 0.001-level

Further, self-evaluation figures of njansang income were combined with change in absolute njansang income data between 2005 and 2010. For this purpose, the latter parameter was divided into six groups (see p. 80). These groups were then analysed in a frequency table which showed a significant linear-by-linear association with the self-evaluation results. The association was stronger for control households than for project households ( $\chi^2$  (1, n = 74): p = 0.002 resp.  $\chi^2$  (1, n = 71): p = 0.015). The frequency table showed that a similar change in absolute njansang income was perceived differently by project and control households. See for example, when we compared the perceptions of project and control households whose income from njansang increased with less than 1 USD day<sup>-1</sup> (Fig. 5.1). Whereas 90% of project households perceived the increase of less than 1 USD day<sup>-1</sup> as an 'increase' or 'large increase' on the Likert-item, only 50% of control households perceived this change as an 'increase', while 40% interpreted this as 'no change'. Thus, project households situated a similar absolute difference in income higher on the Likert-item than control households.



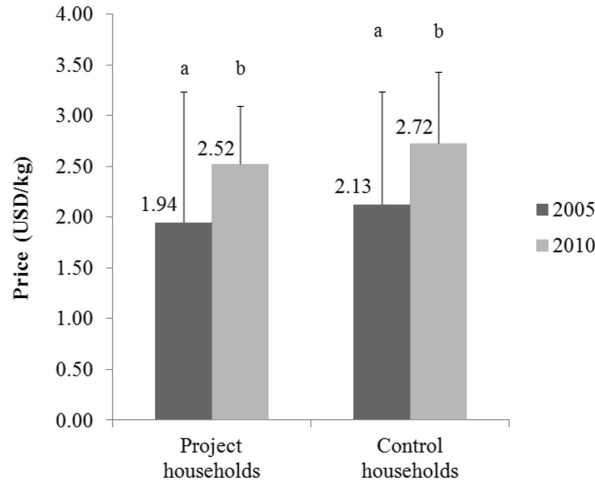


**Figure 5.1:** Self-evaluation of change in njansang income (between 2005-2010) by an absolute income change between 0-1 USD

### Relationship between quantities, prices and commercialization techniques

Changes in income were compared with changes in prices and quantities of the traded product. We already observed that households' mean income from njansang increased from 2005 to 2010. This increase might be explained by several factors whereby most of them will relate to a change of quantity and/or price of the traded product.

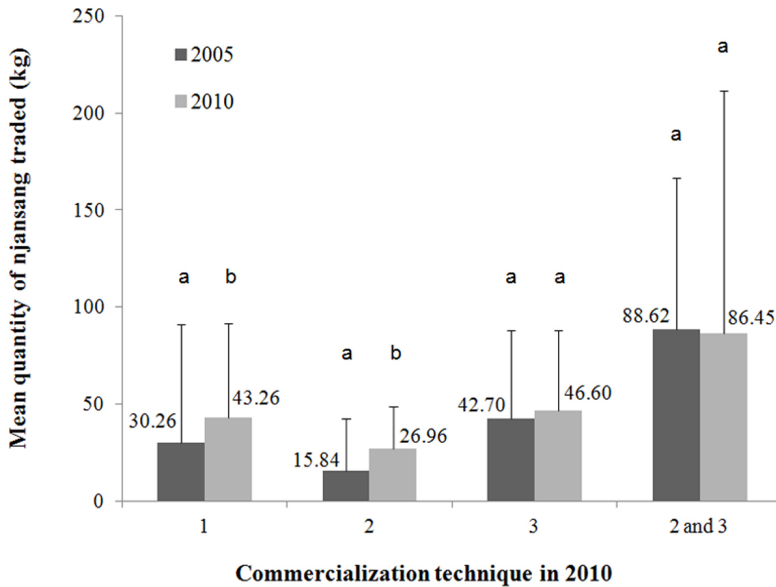
Njansang market prices fluctuate during a year due to the seasonality of product availability (Ayuk et al., 1999; Plenderleith, 2006). Hence, the period of kernel commercialization influences the price received (Ayuk et al., 1999). Moreover, the development organization encouraged njansang groups to conserve their product and organize group sales during months when market prices were high. Therefore, we investigated which were the months during which njansang commercialization took place. In 2005, both project and control households sold their products between December and February (medians). In 2010, project and control villages showed significant differences between the month in which households started selling their product and the month in which they sold for the last time. A difference of about two months was observed (Mann-Whitney test,  $n = 146$ ;  $p < 0.001$ ), with project households starting and finishing trading their product mainly between February and April (medians) while control households sold between December and February (medians).



**Figure 5.2:** Mean prices received for njansang in project and control households in 2005 and 2010 (bars represent standard deviations, different characters indicate significant differences, Wilcoxon signed-rank tests and Mann-Whitney test -between project and control households- n = 160-168)

This temporal shift of njansang commercialization at the level of project households’ was expected to have an impact on njansang prices received, but this was not the case. There were significant increases over the 2005-2010 period of minimum and mean prices within project and control households (Wilcoxon signed-rank test, n = 68 resp. n = 69 : p <0.05). However, these price increases were not significantly different between project and control households (Fig. 5.2). Furthermore, no significant differences between minimum, maximum or mean prices could be observed between project and control households neither in 2005, nor in 2010 (Mann-Whitney tests).

Prices did differ with farmers’ commercialization techniques. Households that sold their product in a market outside the village, received significantly higher prices than those who sold the product to traders, coming to their village (Kruskal-Wallis post-hoc tests, n = 133: p = 0.023). However, for households trading in the village, no significant difference between either group or individual sales could be observed. Thus, the mean price of 2.48 USD kg<sup>-1</sup> for group sales during 2010 did not significantly differ from the mean price that was obtained through individual trading, which was 2.43 USD kg<sup>-1</sup>.



**Figure 5.3:** Applied commercialization technique (2010) and its impact on mean quantities of njansang commercialized: 1) individual trade at domicile; 2) group trade at domicile; 3) individual trade at market outside the village; and combination of 2) and 3) (bars represent standard deviations, different characters indicate significant differences only within a specific commercialization technique, Mann-Whitney tests)

Traded quantities of *R. heudelotii* kernels increased significantly between 2005 and 2010, in project as well as in control households (Wilcoxon signed-rank test,  $n = 85$ :  $p = 0.021$  resp.  $n = 82$ :  $p < 0.001$ ), even though between project and control households no significant difference was detected. With regard to households' commercialization techniques, farmers commercializing njansang in markets outside the village traded significantly larger quantities per year (Kruskal Wallis post-hoc tests,  $n = 167$   $p < 0.05$ ). Although farmers commercializing at village level traded smaller quantities, they did increase significantly their traded quantity between 2005 and 2010 (Wilcoxon signed-rank test,  $n = 61$ :  $p < 0.05$ , Fig. 5.3).

Between 2005 and 2010, there was a significant, positive correlation between traded quantities and absolute income from njansang commercialization in project and control households ( $r = 0.60$ , Spearman's rank,  $n = 85$ :  $p < 0.001$

resp.  $r = 0.61$ ,  $n = 82$ ;  $p < 0.001$ ). Also, changes in prices were significantly correlated with changes in njansang income, but the correlation coefficient was lower and the significance weaker ( $r = 0.23$ ,  $p < 0.01$ ;  $r = 0.20$ ,  $p = 0.04$  for project and control households, respectively).

### 5.3.4 Use of njansang incomes

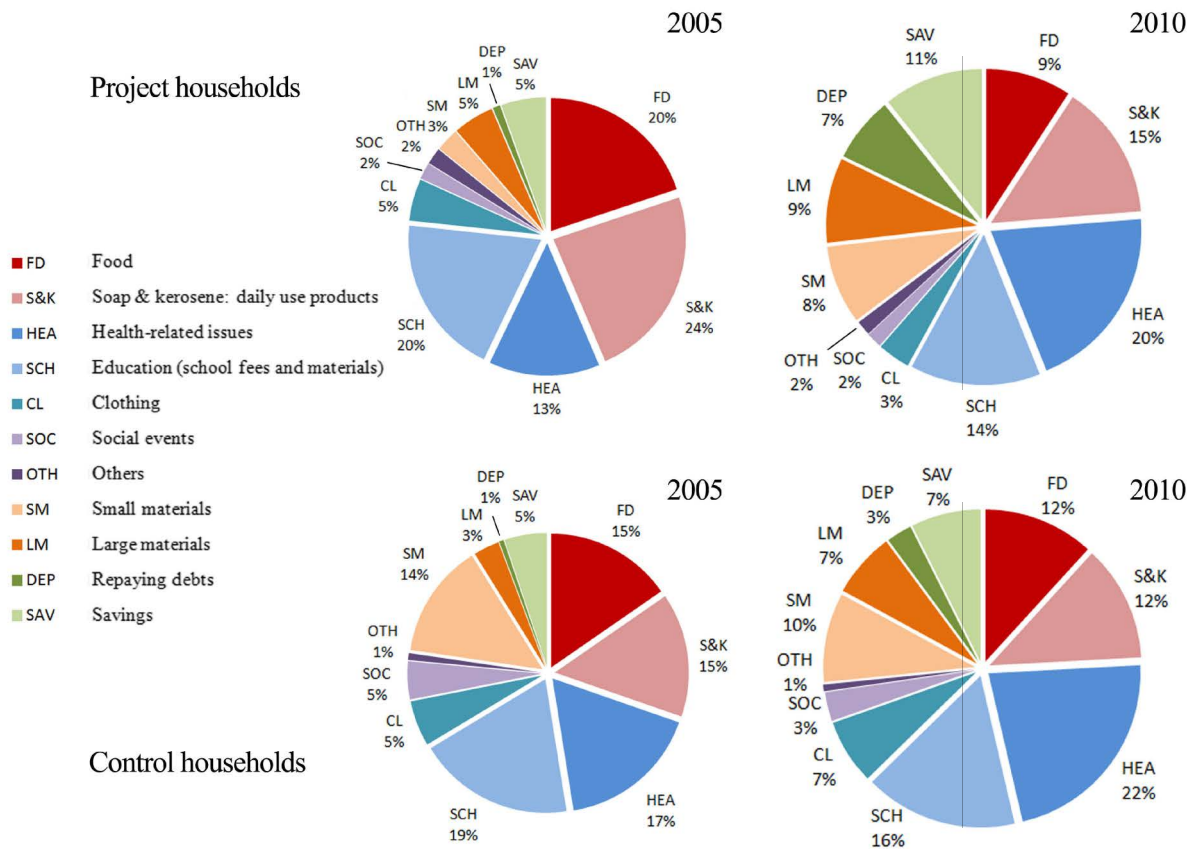
Income from njansang commercialization was used for diverse types of expenses (Fig. 5.4). It particularly contributed to cover primary household needs: to purchase food and products for daily use (such as soap and kerosene). This was particularly the case in 2005.

In 2010, a shift was noticed towards expenditures located higher on the need hierarchy (Maslow, 1943). The observed shift was larger for project households where significant changes between 2005 and 2010 were found (Wilcoxon signed-rank tests). In the latter households ( $n = 57$ ), a significant decrease was observed for expenditures for food ( $p < 0.001$ ) and products for daily use ( $p = 0.002$ ), whereas an increase was found for health-related expenditures ( $p = 0.031$ ) and reimbursing debts ( $p = 0.017$ ). This contrasts with controls ( $n=63$ ), where only slight shifts and non-significant changes were observed. However, absolute values of njansang income expenditures did not indicate any significant differences between project and control households.

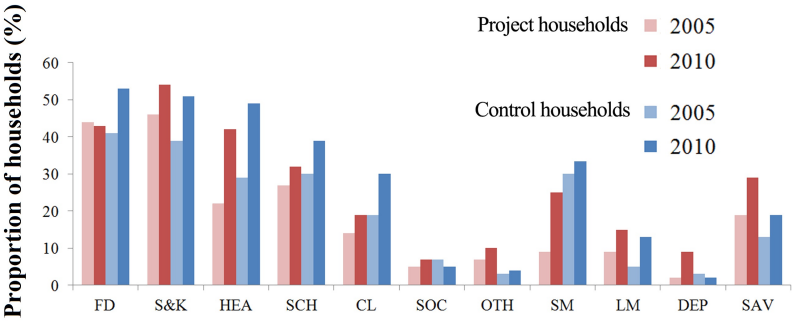
Figure 5.5 illustrates that this trend is also reflected in the number of project households using their njansang income for a particular expenditure. Although not all changes were significant, a decrease in primary need coverage was observed (food,  $\chi^2$  (1,  $n = 133$ ):  $p = 0.047$ ) along with an increase of expenses on other needs (e.g. health issues,  $p = 0.026$ ) and small investments (small materials,  $\chi^2$  (1,  $n = 133$ ):  $p = 0.015$ ). For controls, a significant increase was observed in the number of households using njansang income for health-related expenditures ( $\chi^2$  (1,  $n = 141$ ):  $p = 0.006$ ).

### 5.3.5 Households' wealth linked to involvement in njansang commercialization

Figure 5.6 illustrates that in project villages, njansang commercialization is an activity in which people of all wealth classes were involved, with a slightly higher representation of poorer people. This contrasts with control villages where njansang commercialization was typically an activity of the poorer households in the village. However, differences between project and control villages are not extremely pronounced, whereas standard deviations are quite high. This can be linked to control villages which were involved



**Figure 5.4:** Expenditures of njansang incomes in project and control households in 2005 and 2010



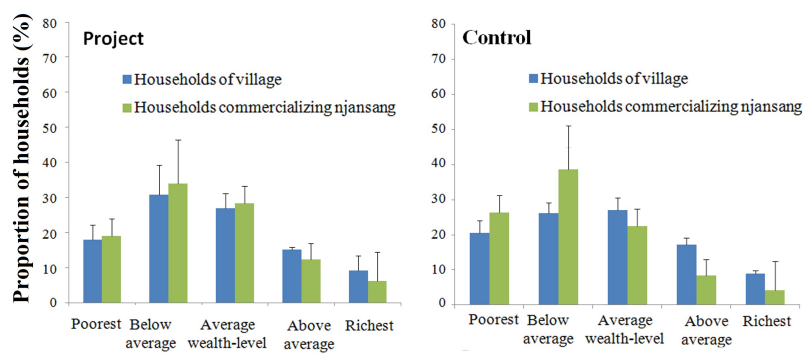
**Figure 5.5:** Proportion of households spending their njansang revenues for specific expenditures (for abbreviations, see figure 5.4)

and well-advanced in njansang commercialization (Fig. 5.7, Omgbwang) and project villages that were just getting involved in these activities and where the wealthier people were still standing on the sideline (Fig. 5.7, Ebassi).

### 5.3.6 Income changes and wealth status of households

There was no relationship between the participatory wealth ranking score and absolute njansang income for project and control households neither in 2005 nor in 2010. Based on wealth ranking scores, three wealth classes were created. In project villages, the middle class gained the highest income from njansang commercialization in 2005. This changed between 2005 and 2010 with the wealthier classes participating increasingly in this activity. Njansang revenues increased significantly more for project households with the highest wealth status (Table 5.5). In 2005, both upper and middle class households were involved only to a limited degree in the commercialization of this product. Thus, a significant difference in njansang earning between the lower and the middle to upper wealth class groups could be observed in 2010, whereas the difference was not significant in 2005.

As to the relative importance of njansang for total cash income, a similar change could be observed (Fig. 5.8). Within project villages, a negative relationship between relative importance of njansang revenues and the wealth ranking score was evident in 2005 ( $r = -0.31$ , Spearman's rank,  $n = 69$ :  $p = 0.010$ ), but not in 2010 ( $r = -0.03$ , Spearman's rank,  $n = 70$ :  $p = 0.78$ ). In contrast to project villages, all wealth classes within control households were involved to a similar degree in njansang trade and changed also similarly between 2005 and 2010. Lower-wealth households in



**Figure 5.6:** Proportion of households distributed over the different wealth classes in project and control villages. All households in the village were compared to households commercializing njansang, in 2010 (data from participatory weighing exercises, n = 4 for project villages, n = 3 for control villages )

**Table 5.5:** Household’s yearly income from njansang commercialization between different wealth classes in project villages

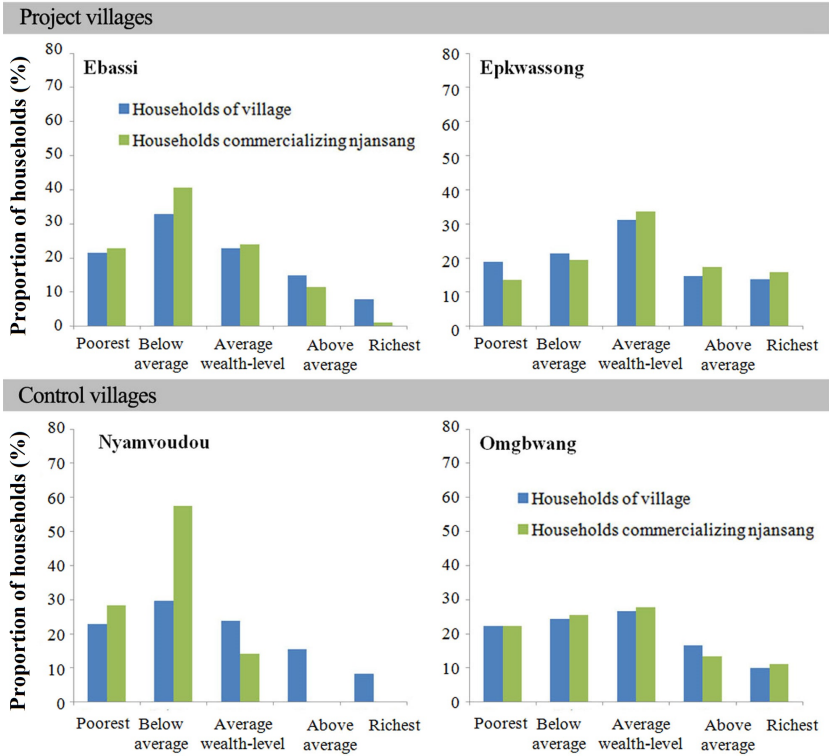
Wealth class (2010)	Median income 2005 (USD)*	Median income 2010 (USD)*	Median change income (USD)*
Lower	14.7 <sup>a</sup>	32.3 <sup>a</sup>	18.3 <sup>a</sup>
Middle	67.3 <sup>c</sup>	83.7 <sup>b</sup>	18.6 <sup>a</sup>
Upper	45.2 <sup>a,c</sup>	148.7 <sup>b</sup>	89.7 <sup>b</sup>

\* Different superscripts indicate significant differences between wealth classes, Kruskal-Wallis post-hoc tests, n = 148

the project villages initially had lower financial gains than their respective counterparts in control villages. However, by 2010, lower wealth households in both project and control villages gained similar incomes from njansang revenues.

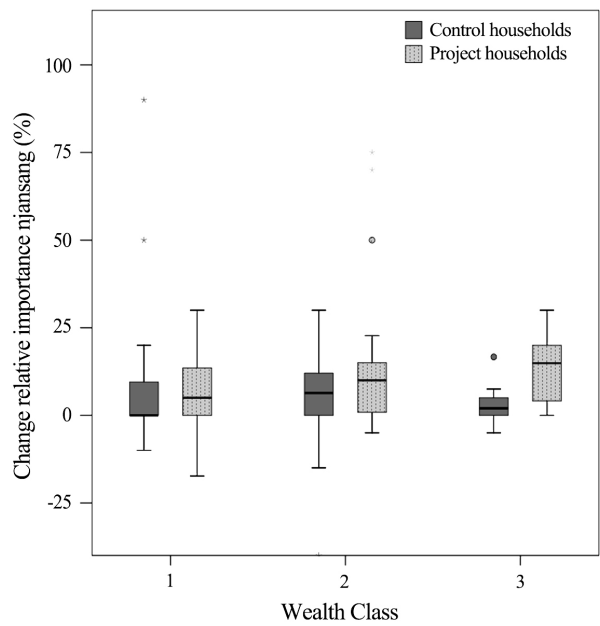
5.3.7 Njansang as cash income in times of scarcity

Compared to controls, a significantly higher proportion of project households saved part of their njansang revenues ( $\chi^2$  (1, n = 160): p < 0.001). Forty-three percent of project households stated to save part of their njansang income (not spent during the first year) in comparison to

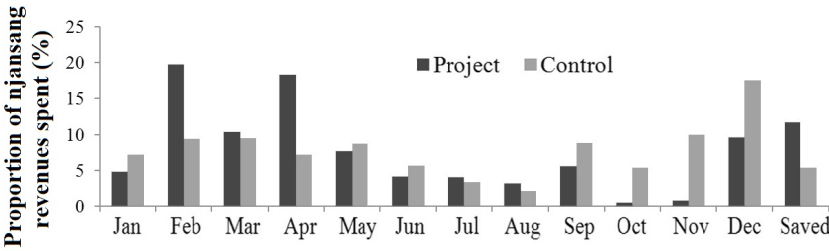


**Figure 5.7:** Comparison of the proportion, per wealth class, of 1) all households in the village, to those of 2) households commercializing njansang; in Ebassi, a project village where project interventions were recent; in Epkwassong, a project village where interventions had been going on for more than 5 years; in Nyamvoudou, a control village with short tradition of njansang commercialization; and in Ongbwang, a control village with a long njansang tradition

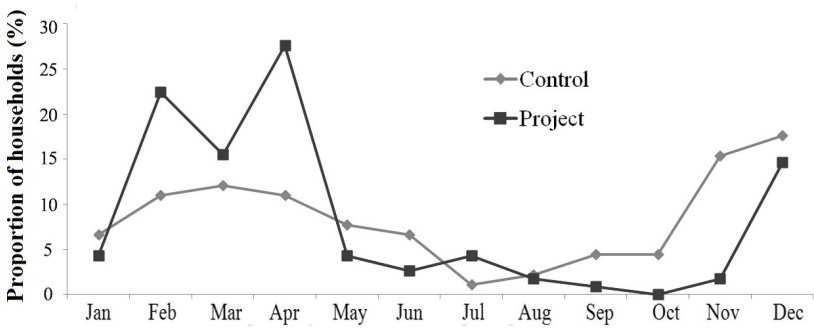




**Figure 5.8:** Boxplot of the change in relative importance of njansang’s contribution to households’ total cash income between 2005 and 2010. Households were grouped in wealth classes of increasing wealth: 1) lower; 2) middle; and 3) upper wealth class



**Figure 5.9:** Expenditures of a household’s njansang revenues in 2010 (based on data collected through a weighing technique on household level, n = 160)

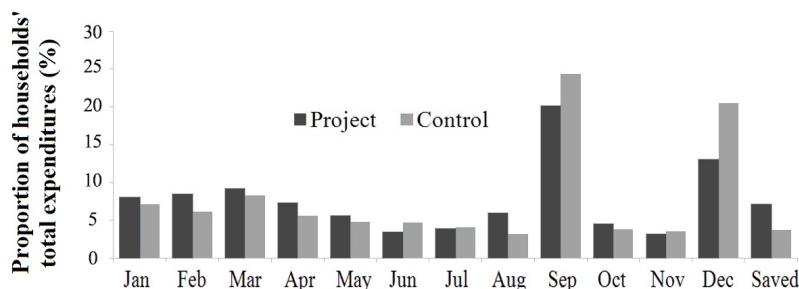


**Figure 5.10:** Monthly distribution of the proportion of households earning cash income from njansang sales (2010, n = 160)

only 16% in control households. Saved proportions amounted to 6 and 13% of households’ annual njansang income for control and project households, respectively (Fig. 5.9).

The income that was not saved, was spent by many households within the same month of earning. During the first month, on average 57% (SD:  $\pm 37\%$ ) of total njansang income was spent in both project and control households. Moreover, the income that was not saved, was generally spent within the first two months (mean: 1.00 month, SD: 1.4 ; and mean: 1.17 month, SD: 1.5, in project and control households, respectively, as illustrated by Fig. 5.9 and 5.10).

A household’s total expenditure pattern was similar in project and control households (Fig. 5.11). Highest expenditures occurred in September and



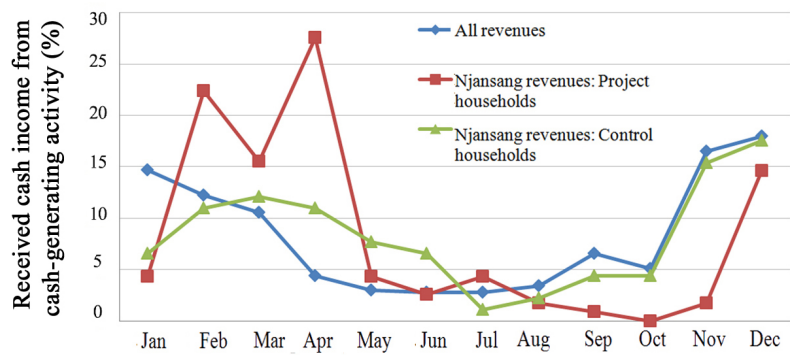
**Figure 5.11:** Household's monthly cash expenditures (2010,  $n = 160$ )

December while in the other months households' expenditures were much lower. High expenditures in September were related to education expenses such as registration fees and purchase of school materials. In December, expenditures were linked to end of the year celebrations. However, project households spent relatively less of their total income in September and December as compared to control households and more during the rest of the year.

To study the gap-filling character of njansang incomes, we compared the periods when njansang commercialization provided incomes with the periods when cash was earned through other activities (Fig. 5.12). For figures on the activities other than njansang commercialization, we based our calculations on the study of Mbosso (2007) (see p. 78).

In control households, njansang incomes had no strong periodical gap-filler characteristics. Njansang-derived income was obtained almost simultaneously with other important crop-related income resources such as cacao revenues (November-December). In project households, as a result of group sales, njansang provided cash a few months later than in control households. At that moment, a lower number of alternative income sources are normally available. In addition, group sales in project villages were organized in June to August period (focus group discussions; Mbosso, 2007) thus functioning even more as a gap-filler, especially because September is a month when households often suffer from cash liquidity problems. Incomes from njansang just before this period help to alleviate households' cash problems. The gap-filling character was not so pronounced in the present study because in 2009-2010 no large group sales were organized during this period.

Furthermore, 30% of project households said to rely heavily on njansang



**Figure 5.12:** The main monthly relative cash revenues from a certain activity illustrate the periodic character of a household’s revenues. Figures of relative contribution of all cash income activities per month are adapted from Mbosso (2007) who performed a socio-economic study in Epkwassong, one of the project villages. Superimposed is the proportion of households gaining njansang revenues during a particular month in project and control villages, as evidenced from the present study (n = 163)

revenues when annual incomes of other activities are low. Thus using njansang incomes as a safety net. In control households, this proportion attained 38%.

## 5.4 Discussion

### 5.4.1 Do interventions to promote NTFP commercialization help to increase a household’s financial gains?

The present study showed that project interventions to promote njansang commercialization helped households to get involved faster and attain higher financial benefits from its commercialization than counterfactuals. This was reflected in higher increases in absolute income derived from njansang commercialization and the latter’s contribution to total cash income, and through farmers’ perceptions of njansang’s importance to total household income as assessed in self-evaluation.

Furthermore, an increase in total household income was often linked to the increased commercialization of njansang, especially in project households.

The latter had become more involved in njansang commercialization and featured higher gains than controls, even though not all financial parameters were significantly different between project and control households. However, we evidenced that in 2005 project villages had been less involved in the value chain of *R. heudelotii* kernels than control villages. Observed economic benefits might have been easier to attain in project villages as marginal costs probably increase when larger njansang quantities are commercialized. This, due to disproportionate, increasing collection and transport costs when collecting larger njansang quantities. This is linked in particular to the disperse spatial distribution of *R. heudelotii* trees. It means that to collect high njansang quantities, farmers have to go and collect fruits under trees located at large distance from their domicile.

#### **5.4.2 The financial importance of njansang commercialization**

Our study showed that commercialization of *R. heudelotii* kernels is of high financial importance for households in project and control villages. In 2005, project villages were less-involved in commercialization of *R. heudelotii* kernels than control households. This was demonstrated by the different percentages of households involved between project and control villages (Table 5.2) and the different financial importance of selling njansang during that year (Table 5.3).

The contribution of njansang to total household cash income of 5-10% in 2005, was already reported by Sunderland et al. (2003). Compared to other studies in the humid forest zone of Cameroon, the contribution of njansang commercialisation to total cash income within project and control households was high in 2010 (10-25%). For example, Sunderland et al. (2003) mentioned a share of 6.6% for the contribution of njansang to household total cash income whereas Lescuyer (2010) found that all NTFPs together, contributed only 5% to households total cash income of farmers.

In the present study, the high economic importance of njansang can probably be explained by the high demand for the product in this region. This high demand in turn is linked to the proximity of large, urban markets. The most remote village sampled is located less than 100 km from the country's capital. Brown and Lassoie (2010) demonstrated that in the humid tropic zone of Cameroon, a positive relation exists between the vicinity of urban areas and their markets and the demand for *R. heudelotii* kernels. Similar relationships have also been found for other NTFPs. Neumann and Hirsch (2000), among others, stated that geographical location influences the importance of NTFP contribution to household incomes. In the present

study, this was also evidenced by the results from Omgbwang and Ebassi. They are located next to the capital and njansang commercialization had in these villages a higher financial importance for households than in the other villages.

The present study also showed that the importance of njansang as a source of income increased over the years in all sampled villages and probably in the whole region (cfr supra Tables 5.2 and 5.3). As indicated by Plenderleith (2004), Tieguhong and Ndoye (2006) and Manirakiza (2007), this trend can be explained by the increasing demand for njansang on local, national and international markets. In contrast to our results, Lescuyer (2010) documented a decline of the importance of NTFPs for rural household incomes in Cameroon. The results of our study differ from Lescuyer's which might be partly explained by the geographical location of the latter author's study, which was conducted within more isolated regions in Cameroon.

The njansang commercialization activity we documented, was generally a gap-filling activity which provided households with an additional cash income next to that obtained from other farm and off-farm cash-generating activities. This is the case for most NTFPs (Marshall et al., 2006b). In project households, there was also an increase of people using their income for the repayment of debts. Because households were certain to have an income from njansang, they would and could borrow money more easily, knowing they could pay it back after njansang sales. Furthermore, one third of the households additionally used njansang as a safety, to obtain a higher income in years of scarcity. Finally, njansang showed characteristics of a stepping stone out of poverty which could aid farmers to accumulate savings and alleviate poverty in the long run. However, the lion's share of njansang incomes was still used to cover basic needs whereas the absolute value of savings obtained through njansang commercialization can be considered to be low (7-11%).

#### **5.4.3 Increased income, a matter of prices or quantities?**

Mean annual unit prices in 2005 and 2010 and price increases over the complete period did not differ between project and control villages although differences were expected due to: 1) the differences in time of the year when project and control households sold their njansang combined with the seasonal dynamics of the demand-supply curves throughout the year (Ndoye et al., 1997; Ayuk et al., 1999; Plenderleith, 2004); and 2) the presence of a producer group in project villages trained on and applying commercialization strategies that increase bargaining power

and consequently prices and income from their product (Ndoye et al., 1997). Households that sold their product to markets outside the village received significantly higher prices and traded larger quantities. Although these households received higher prices, trading in urban markets meant additional cash expenses due to transaction costs such as transport costs and payment of market fees. Especially transportation costs are very high. They depend to a large extent on distance to the market and state of the road. Farmers rarely travel to urban markets with the sole purpose of selling njansang. In addition, small quantities of njansang were often transported to the market without extra costs. On the other hand, in project villages, households did not have to bear the cost of selling their produce outside of the village; but as member of the producer group, they had to pay admission fees and yearly contributions.

The mean prices we calculated for njansang of 2.1 USD kg<sup>-1</sup> (2005) and 2.6 USD kg<sup>-1</sup> (2010) are higher than the mean prices mentioned by Ayuk et al. (1999) who found on a maximum of only 1.2 USD kg<sup>-1</sup> (adjusted price with inflation rate of 2.56%). Although Ayuk et al. (1999) studied more remote areas in Cameroon, the large price difference confirms the increase of njansang's economic value in the Nyong-et-Mfoumou department in Cameroon. The enhanced income in 2010 was mainly related to an increase in traded quantities and, to a lower extent, to an increase in unit prices. Ayuk et al. (1999) reported quantities of 20 kg per household per year whereas our study shows households traded average quantities of 40 kg per year. Although this difference might be caused by difference in natural availability of the species, it presumably also refers to a more intensive exploitation of the product by the farmers in our region.

#### **5.4.4 Omgbwang: a village with special characteristics**

Omgbwang village has a longer njansang commercialization tradition than any of the other villages. In 2005, the knowledge of the product's potential and contribution to cash income was already widespread throughout the village, with all households commercializing njansang. The importance of njansang's contribution to households' total cash income and its absolute income did not change in Omgbwang between 2005 and 2010. This could demonstrate that the commercialization in this village had already reached its 'full' potential in 2005 and possibly stagnated due to constraints in resource availability and high opportunity costs to harvest, process and trade.

As from the year 2000, inhabitants of Omgbwang made a yearly agreement about the minimum unit price they should obtain when commercializing njansang before the start of the production season. This feature of

spontaneous price setting by producers was not observed in other villages, where prices were mainly imposed by traders. Even in Ebassi, which is located at a similar distance to the nearest market as Omgbwang, no price setting occurred. Price fixing in Omgbwang is linked to the households' long experience in njansang commercialization. In addition, the road through Omgbwang serves as a gateway to more remote villages and as an entrance to the northern area, which is not the case for Ebassi. Both features have probably favoured njansang trade in Omgbwang.

A rapid early increase in the number of households commercializing njansang in particular villages could be attributed to the known presence of early adopters, occupying prominent positions in the village, commercializing njansang in Omgbwang and the subsequent involvement of other households. Another important reason for households to start commercializing njansang, was the high demand by traders for more than a decade, making the farmers aware of the value of njansang.

#### **5.4.5 Pro-poor development?**

As confirmed in this study, NTFPs play an important role in the livelihoods of the poor because they are among the few cash-generating activities with sufficiently low entry requirements for poor people to participate (Marshall et al., 2006b). However, the involvement and importance of a NTFP for households largely depends on type and specific characteristics of the product under consideration. If the production and commercialization of the specific product require important financial inputs, this product is more likely to benefit households with larger incomes prior to adaptation who can afford to invest (Marshall et al., 2006b). Commercialization of njansang, although labour-demanding, does not require much cash input and is thus affordable by all wealth classes. Nevertheless, the development of njansang promotion and the related organization, as has been induced by the project, implies additional costs for the producers. Although costs are rather limited, focus group discussions indicated that these costs discouraged some households from engaging into a njansang group.

In addition, we observed that promotion of njansang commercialization, an activity which was originally typically conducted by poor households, encouraged also the wealthier households of the villages to get involved in njansang trade. The involvement of wealthier households was also observed in Omgbwang, the control village with a longer tradition of njansang commercialization. Hence, over time it seems that also wealthier households are likely to engage in the njansang value chain whereby this involvement is not solely a consequence of active njansang promotion by external parties.



In control villages without a long njansang commercialization tradition, only poor households market njansang. The high involvement of the poor and the very limited participation of the wealthier is characteristic for many NTFP chains (Marshall et al., 2006b; Neumann and Hirsch, 2000; Jodha, 1986). Moreover, research shows that, if and when they are given the opportunity, people involved in NTFP extraction will indeed opt for alternative income-generating activities (Neumann and Hirsch, 2000). In contrast to this, our results show that over time njansang commercialization became more important and wealthier households became involved as well. The increased involvement of wealthier households could be linked to several factors such as: lack of knowledge about njansang's market value in the village, especially among wealthier households; growing markets for njansang on local, national and regional levels (Manirakiza, 2007; Plenderleith, 2004; Tieguhong and Ndoeye, 2006); and high unit price of njansang and the profitability of the activity. We do thus conclude that geographic location and market access play a crucial role with respect to the economic profitability of this labour-intensive activity which might lead to different results if more remote villages would have been included in our study.

#### **5.4.6 An objective or subjective approach to assess income changes?**

The change in income from njansang commercialization on household level between 2005 and 2010 was evaluated through monitoring changes of two objective parameters, namely: change in relative importance of njansang to total cash income, and change in absolute njansang income data. We also used a subjective parameter, namely, self-evaluation of perceived income change on a 5-point Likert-item.

The subjective measure showed more significant differences between project and control households than the absolute income data derived parameters. It thus produced a more positive image of the project intervention. Moreover, similar increases in absolute income were evaluated higher on the Likert-item by project than by control households. In addition, the correlation coefficients between the objective and subjective parameters were higher for control households.

It cannot be ascertained that the objective, direct measuring method is preferred over the subjective one based on farmer's perception. On the one hand, the subjective method is based on the judgement of people and this could have been influenced on multiple levels. Farmers could have paid less attention to the actual impact and contribution of the product in the past,

and could thus perceive a larger change and higher gains than what actually occurred. Moreover, project interventions in this study possibly brought along other improvements in livelihood such as social (e.g. producers groups, social cohesion) and human assets (e.g. capacity building, self-esteem). Although the questions specifically focused on income, improvements of other livelihood assets might also have influenced respondents' answers. In addition to this, the occurrence of a 'conspiracy of courtesy' as stated by Menton et al. (2010) wherein respondents attempt to please the interviewer by giving what they perceive to be the desired answer, cannot be excluded. Even though the necessity of objectivity was clearly explained at the beginning of each interview, the authors contacted the sampled households through the project managers and households might have adjusted their answers with the idea of 'conspiracy of courtesy' towards the project. In addition, answers might have been distorted for expected personal reasons or gain. For example, farmers in Epkwassong concealed certain positive changes such as the acquisition of television sets and DVD players. Probably, farmers feared that the development project would stop its interventions once these positive changes were detected.

Lucky enough, some of this information was revealed during focus group discussions, showing the importance of participatory techniques to complement surveys as mentioned by Menton et al. (2010).

Another limitation of income data obtained through quantitative data is that absolute data on njansang revenues were only available from two years and although *R. heudelotii* is known as a regular fruit producer, fruit production does vary between years and regions (Plenderleith, 2004). Thus, pointing in favour of a subjective approach. Yet another aspect favouring the subjective assessment is that farmers' estimates of absolute quantities and their derived incomes can be very inaccurate (Menton (2006) as mentioned by Menton et al., 2010).

In the case of this study, we suspect some changes from njansang commercialization remained undetected due to the high variability in local devices to measure quantities (e.g. glasses, cans, plates, etc.) and methods (recipients filled to the top or filled over the top) used during selling. In addition, errors were introduced due to the unknown accuracy of retrospective data (Menton et al., 2010; Bernard et al., 1984). Based on the higher correspondence between objective and subjective parameters for control households, the subjective assessment might have overestimated the actual economic impact of njansang commercialization in project households. However, subjective data could yield a biased image of the situation. In a further stage they should be corroborated by quantitative, more objective data, whereas quantitative data should be recorded

continuously to overcome problems in variation of yearly fruit production and minimize retrospective errors.

## 5.5 Conclusions

*Ricinodendron heudelotii* (Baill.) Pierre ex Pax. kernel commercialization is an important income generator for households in the Nyong-et-Mfoumou department, Cameroon. Its contribution to the households' financial situation increased between 2005 and 2010. Farmers increased the amount of njansang traded whereas unit prices increased as well. Project interventions to improve njansang commercialization assisted the involved households and villages to develop at a higher pace than the rest of the region. The interventions had a significant financial impact on both the poorest and wealthiest households, but absolute profits gained by the wealthier were clearly higher. Although at the beginning of a development project, poorer households are often targeted, it is indispensable to keep them involved all along and ensure that they capture at least part of the generated benefits. Hence, it is vital to closely monitor project's interventions and its outcomes, and corrective strategies if necessary.



# Chapter 6

## Social assets

**Can rural development projects generate social capital?**



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## 6.1 Abstract

Social capital is an important pillar of farmers' livelihoods and its importance for sustainable rural development has been recognized. Nevertheless, the creation of social capital through external interventions remains challenging. This study investigated the generation of social capital within a rural development project of the World Agroforestry Centre that promotes *Ricinodendron heudelotii* (Baill) Pierre ex Pax. kernel commercialization. Combining quantitative and qualitative measurement techniques, the change in social capital over a period of five years was evaluated. Households of project villages were compared to control households. Project households increased their social assets significantly at different levels. Development interventions thus enhanced social capital. This improvement was reinforced by a positive change of other farmer livelihood assets, in particular financial capital. This study reveals the complexity of social capital generation through external interventions and its implications towards farmer livelihoods promotion specifically and development work in general.

## 6.2 Introduction

An important aspect of farmers' livelihoods are the social networks and institutions they are embedded in, together with the nature of interpersonal interactions that sustain them (Nahapiet and Ghoshal, 1998; Woolcock and Narayan, 2000). These relationships constitute a valuable resource for the conduct of social affairs, and provide people with resources to cope with many aspects of their daily life (DFID, 1999; Narayan and Pritchett, 1999). The collection of these human interactions and structures are categorized under the term 'social capital', a term that has been very loosely applied in literature to cover a whole range of non-economic aspects of these interactions (Bebbington, 2002; Rydin and Holman, 2004; Woolcock, 1998).

In the academic world, the concept of social capital has increased in use and importance with the publication of Putnam's influential work in the 1990s (Putnam et al., 1993; Putnam, 1995). It is currently applied in a broad range of research areas, for instance, in the area of sustainable development. Linking social capital to sustainable development and sustainable rural development in particular, has gained much interest over the last decade (Rydin and Holman, 2004; Woolcock and Narayan, 2000; Coleman, 1988; Fox and Gershman, 2000). Its implementation has proven to significantly affect the efficiency and sustainability of rural development programs (Sorensen, 2000; Michellini, 2013; Bebbington, 1997).

Social capital mainly contributes to sustainable economic development of the poor in two different ways: it can resolve collective action problems, whereas it also enables the reduction of transaction costs between actors (Rydin and Holman, 2004; Porter and Lyon, 2006). Both are about encouraging relationships between actors. The first aspect focuses on the individual actor in relation to the group. These types of relationships can be categorized under 'bonding' social capital, which refers to the links within groups or communities (Rydin and Holman, 2004), also formulated as '*connections between people like you*' (Woolcock and Sweetser, 2002). It is in particular associated with networking within a bounded area and with strong place-based identification with that area (Rydin and Holman, 2004).

The second aspect, the reduction of transaction costs between actors, tries to alter the net costs of existing transactions in the form of exchanges between actors (Rydin and Holman, 2004). These relationships with '*people who are not like you in a some demographic sense*' are known as 'bridging' social capital (Woolcock and Sweetser, 2002). Poor people usually have a closely knit and intensive stock of bonding social capital, while they lack bridging social capital which could connect them with '*the outside world*' (Woolcock and Narayan, 2000).

In addition, more recently a third category of social capital has been distinguished, namely 'linking' social capital which refers to '*connections with people in power, whether they are in politically or financially influential positions*' (Woolcock and Sweetser, 2002). It also includes vertical connections to formal institutions (Woolcock, 2001). However, the poor rarely possess any kind of linking social capital (Woolcock, 2001).

Next to bonding, bridging and linking social capital, Nahapiet and Ghoshal (1998) suggest to divide social capital in three additional clusters or dimensions: structural, relational and cognitive. The structural dimension describes the impersonal configuration of linkages between people or units while the relational dimension focuses on the personal relationships that people have developed with each other. The last dimension is the cognitive one, which assesses the shared representations, interpretations and systems of meaning among parties. The subdivision of social capital into smaller dimensions makes the concept more manageable and facilitates data collection, analysis and interpretation (Nardone et al., 2010).

Although the importance of social capital is recognized by most rural development institutions, it remains a difficult area to take into account during development interventions and even more difficult to intervene in. Contrary to other livelihood capitals it is thought to be much harder to generate through external interventions (Ostrom, 2000). Empirical data on social capital in general are limited (Paldam, 2000). Moreover, data on whether development assistance can enhance social capital are even scarcer (Gugerty and Kremer, 2000). The few studies that do discuss the matter indicate divergent results (e.g. Vervisch et al., 2013; Sanginga et al., 2010; Michelini, 2013). For example, Porter and Lyon (2006) state that in Ghana social capital and groups are often created just because it lies in the line of what donor organizations ask for, while they are often not sustainable and do not improve livelihoods for the poor. On the other hand, under certain socio-economic conditions, group formation and other social capital enhancements do enable the poor to improve their livelihoods (Facheux et al., 2006, 2012; Vermaak, 2009; Sanginga et al., 2010). Understanding how development projects can deal with and reinforce social capital rather than cause damage to it during interventions remains a great challenge of development (Vervisch et al., 2013; Fox and Gershman, 2000; Woolcock and Narayan, 2000).

This paper aims to contribute to narrowing this knowledge gap by examining the impact of development projects on social capital development in the tropical humid forest zone of Cameroon. The investigated research-for-development project, called 'Agroforestry Tree Products for West and Central Africa' (AFTP4A) and led by the World Agroforestry Centre



(ICRAF), focuses on the promotion of commercialization of *Ricinodendron heudelotii* (Baill.) Pierre ex Pax. kernels (njansang).

Njansang is a non-timber forest product which is used as a thickening ingredient in soups and stews after crushing the fruits' seeds (Fondoun et al., 1999). Trade of kernels provides cash income to many households in Cameroon (Cosyns et al., 2011; Plenderleith, 2004; Ayuk et al., 1999). The product is traded on local, national and, to a lesser extent, international markets (Plenderleith, 2004). Collecting, processing and trading are labour-intensive activities and typically done by women (Tchoundjeu and Atangana, 2006). More information on *R. heudelotii* can be found in chapter 2.

External interventions to promote non-timber forest products in rural tropical areas are challenging and many authors have stressed the need to include social aspects to obtain successful commercialization (Neumann and Hirsch, 2000; Marshall et al., 2003, 2006a; Belcher and Schreckenberg, 2007). Although the main goal of the AFTP4A project, described in this paper, was to increase and diversify farmer incomes, creation and/or further development of social capital took a prominent place within the project approach.

This study addresses the question of what the impact is of a project targeting commercial development of a non-timber forest product on social capital and whether social capital can be created by external interventions.

## 6.3 Material and methods

### 6.3.1 Study area

Fieldwork was conducted in the tropical moist forest zone of Cameroon, located between  $3^{\circ}52' - 4^{\circ}20' \text{ N}$  and  $11^{\circ}57' - 12^{\circ}30' \text{ E}$ . The villages in the study zone consist of Bantu smallholder farmers of various ethnic groups. Cropping systems consist of fallow-based food crop production (shifting cultivation), multistrata homegardens and semi-permanent, cash crop plantations of mainly cocoa (*Theobroma cacao*) and lowland robusta coffee (*Coffea canephora*) (Ayuk et al., 1999). For more information: see chapter 4.

The population in the region has gone through a series of socio-economic revolutions related to different colonization regimes, the economic crisis of

the mid-1980s and extreme price changes of the main export products (for more information on the socio-economic changes over time: see section 4.2)

Nevertheless, households in the region have always been capable to adjust their livelihood strategies in relation to these changing environments (Degrande, 2005). The most recent important challenge farmers faced was induced by low international cocoa and coffee prices starting begin 1990s and persisting to the early 2000s. Farmers responded by intensifying the cultivation and commercialization of food crops. By refocusing on alternative income sources instead of revamping traditional cash crop cultivation, non-timber forest product commercialization, such as njansang trade, gained importance. Although cocoa prices increased again in recent years, to date this trend of intensifying alternative income sources continues.

Within the study zone, we located villages in which marketing activities of ICRAF and partners were being implemented at the time of the present study, i.e. 2010-2011 (ICRAF, 2007). These projects aim to increase, diversify and stabilize incomes of poor, small-scale farmers by increasing their participation in and benefits from agroforestry tree products’ value chains. For more information on the development project, we refer to chapter 4.

In practice, initial project interventions focused on creating and reinforcing social capital in the villages. This reinforcement derives from ICRAF’s vision for successful NTFP commercialization and implies creating coherent, smoothly functioning non-timber forest product producer groups (Facheux et al., 2006). To establish these groups, training sessions were organised, focusing on group dynamics and conflict resolution, as well as more technical aspects concerning the commercialization process (Table 6.1).

**Table 6.1:** Training programs received by farmers in the different project villages of this study

		<i>Epkwassong</i>	<i>Ondeck</i>	<i>Loum</i>	<i>Ebassi</i>
<i>Training programs</i>	Group dynamics	V	V	X	V
	Conflict management	V	V	X	X
	Market functioning	V	V	X	V
	Financial management	V	V	X	X
	Tree domestication	V	V	X	V

V = yes, X = no

### 6.3.2 Sampling method

For information on the general sampling procedure, we refer to chapter 4.

Stratified sampling was done at village level. Villages were selected based on presence or absence of a marketing project conducted by ICRAF and partners. We first selected 'project villages' with 'project households' which benefited from a marketing project. All (four) project villages in the Nyong-et-Mfoumou department were selected (Table 4.3). Next, for each of these project villages, a 'control village' with its 'control households' were selected for comparison. Selection of a control village was based on its similarity with its respective project village with focus on socio-economic characteristics that could influence njansang commercialization (Tables 4.2 and 4.3). The idea behind the selection is that each project and its respective control village and households were alike at the start of project implementation, especially regarding njansang commercialisation.

At household level, data were collected through semi-structured questionnaires featuring retrospective methods according to Omilola's (2009) guidelines. Additional data were gathered through participatory approaches at village level according to the guidelines from Marshall et al. (2006b). More specifically, focus group discussions and interviews with key informants focused on trends and changes within the village following njansang commercialization. Issues such as: njansang use and management, conflict on njansang related issues such as tree ownership, resource privatization, gender, community organizations, etc. were discussed. The majority of the questions focused on the situations in 2005 and 2010, whereby 2005 coincides with the pre-project situation.

The present study used a framework based on the differentiation primarily between bonding, bridging and linking (Woolcock, 2001; Putnam, 2000), and subsequently between the structural, relational and cognitive dimensions of social capital (Nahapiet and Ghoshal, 1998). This resulted in a multi-dimensional framework in which proxies were selected for each dimension (Table 6.2). Due to the high site and scale dependency of social capital (Grootaert and Bastelaer, 2001) the '*a priori*' selection of proxies based on literature was considered inadequate. Therefore, most proxies were established after authors got acquainted with the study environment, i.e. after the first data collection period in 2010. New proxies were introduced in an additional questionnaire and data on them collected in 2011. The amount of proxies in each of the dimensions resulted directly from the field observations, focus group discussions and reflected the complexity and current state of the different dimensions of social capital in the villages. Hence, bridging social capital was restricted to measuring the structural

and relational dimension. Cognitive aspects of bridging social capital such as shared representations or common goals between farmers and traders were not specifically promoted by project interventions, whereas during focus group discussions, stakeholders stated that these cognitive dimension did not change in the 2005-2010 period. The proxies used in the present study are a combination of proxies presented in literature (World Bank, 2010; Kusters et al., 2006; Narayan and Cassidy, 2001) adjusted to the local conditions, and new proxies taking into account the specific situation in the study environment. Data on numerous proxies were only collected in project villages and not in the control villages as they were related to project's interventions (see Table 6.2).

Statistical data analysis was conducted with SPSS 17 (SPSS Inc., 2008). For some tests, household data of project villages were pooled and tested against pooled household data from control villages. Collected data types were mainly ordinal and nominal thus leading to non-parametric statistical tests. To study the structural dimension of bonding social capital, we estimated membership overlap between the njansang group and the other organizations a farmer belonged to. We did so using the fifth proxy in Table 6.2. In control villages, no njansang group existed. Hence, we created a fictive njansang group of which the members where all the farmers commercializing njansang in the village. Next, households in each village could estimate the membership overlap with this fictive njansang group.

**Table 6.2:** Proxies evaluating social capital in project households

<i>Questions</i>	<i>Answer possibilities</i>
<b>Bounding Structural</b>	
Which voluntary associations/groups exist in this village? <sup>a,d</sup>	open
How many members does each group count? <sup>a,d</sup>	number
How many groups are you voluntarily associated to? <sup>d</sup>	number
Which groups do you consider the most important? (top 3)	open
How many members in the njansang group are also members in other groups you belong to? <sup>d</sup>	few (<1/3); moderate ( $\geq 1/3$ ; <2/3); many ( $\geq 2/3$ )
Do you work together in small groups for njansang-related activities? <sup>c,d</sup>	yes/no
For which activities? <sup>d</sup>	open
With which frequency during periods of need? <sup>d</sup>	times month <sup>-1</sup>
Did you work already in small groups for njansang-related activities before the project came? <sup>d</sup>	
With which frequency? <sup>d</sup>	less; equal; more
Did you work already in small groups for other activities before the project came? <sup>d</sup>	yes/no
<b>Bounding Relational</b>	
How did your relations with the members of the njansang group change?	3-point Likert-item <sup>b</sup>
How did your relations with all other farmers in the village change due to njansang commercialization? <sup>d</sup>	3-point Likert-item <sup>b</sup>
Do you trust the members of the njansang group more or less?	3-point Likert-item <sup>b</sup>
When you are in need, will members of the group help you more or less than before the group existed?	3-point Likert-item <sup>b</sup>
Did your capacity to resolve problems change?	3-point Likert-item <sup>b</sup>
If so, where/when do you apply this skill?	in njansang group; in other groups; in the household; other
How did the situation in your household change due to the project interventions and the commercialisation of njansang? <sup>d</sup>	3-point Likert-item <sup>b</sup>
Did something change with reference to:	
Organisation?	3-point Likert-item <sup>b</sup>
Trust?	3-point Likert-item <sup>b</sup>
Conflicts?	3-point Likert-item <sup>b</sup>
Cohesion/ Unity?	3-point Likert-item <sup>b</sup>
Position of the women?	3-point Likert-item <sup>b</sup>
<b>Bounding Cognitive</b>	
Did your pride to belong to this village change?	3-point Likert-item <sup>b</sup>
Do you feel whether or not the unity in the village changed, that you are more or less united?	3-point Likert-item <sup>b</sup>

*Continued on next page*

Table 6.2 – Continued from previous page

Questions	Answer possibilities
<b>Bridging Structural</b>	
Did you create new professional contacts with individuals from outside the village through the project?	yes/no
With which frequency do you have contact with them?	rarely; once year <sup>-1</sup> ; several times year <sup>-1</sup>
How many other professional contacts do you have outside the village that you contact at least once a year (not linked to the project)? <sup>d</sup>	number
<b>Bridging Relational</b>	
Do you trust people from outside the village in general more or less since the project arrived?	3-point Likert-item <sup>b</sup>
Do you trust traders from outside the village more or less since the project arrived?	3-point Likert-item <sup>b</sup>

<sup>a</sup> data collected during focus group discussions  
<sup>b</sup> 3-point Likert-items evaluated change and could all be reformulated as:  
-1: negative change; 0: no change; and 1: positive change  
<sup>c</sup> refers to small groups and activities besides those of the njansang group  
<sup>d</sup> questions also collected in control villages, some slightly rephrased

## 6.4 Results

Based on our research framework, results for bonding, bridging and linking social capital are represented separately. Then, within these three main categories, structural, relational and cognitive aspects are examined.

### 6.4.1 Structural aspects of bonding social capital

#### The importance of njansang groups

Njansang groups, with the aim to commercialize njansang, were medium-sized groups compared to the other associations mentioned by the interviewed farmers (Table 6.3, 'number of members in njansang groups'). Larger groups (3 to 5 time larger) were generally religious and financial associations. Smaller groups were 'rotating savings and credit associations' locally known as 'tontines', typically consisting of 5 to 10 persons and functioning as informal saving and credit organisations (ROSCA) (Bouman, 1979).

The importance of a njansang group, with respect to the creation of new connections, was evaluated on a 3-point Likert-item. The options on the Likert-item quantified membership overlap between njansang group (actual overlap for project-, and fictional overlap in control villages) and other groups the household member belonged to (Table 6.2). Both in the project and control group, membership overlap was evaluated at >33% by more than 85% of the households, and as >66% by more than 35%. However, membership overlap in control households was significantly lower than in project households ( $\chi^2$  (1,  $n = 160$ ):  $p < 0.001$ ). Hence, formation of a njansang group in control villages would have a higher positive impact on structural social capital than it did in project villages.

In addition, the commonly perceived importance of the njansang group in comparison to other groups was evaluated using a ranking exercise. All project households ranked the njansang group within the three most important groups they belonged to: 50% of them put the group on the first place; 34% on the second and 16% on the third. High ranks of the njansang groups demonstrate their importance. On average, households in the project villages belonged to 3 to 4 groups, while those in control villages belonged to 2 to 3 groups. The number of groups of which a person was a member differed significantly between project and control households in 2010 (Mann-Whitney test,  $n = 160$ :  $p < 0.001$ ). Furthermore, the proxy did not significant differ when the situation before project intervention was simulated by omitting household's membership to the njansang group (Mann-Whitney test,  $n = 160$ :  $p = 0.767$ ).

### Subgroups to tackle njansang activities

Project interventions stimulated the formation of subgroups among farmers to assess their njansang-related activities more efficiently. Before project intervention, farmers tended to work already in small groups for some livelihood supporting activities (mainly agricultural activities) which was the case in 81% and 72% of project and control households, respectively. Nevertheless, for njansang-related activities only 4.6% of farmers in project households collaborated and 3.8% in control households, and there were no significant differences between them ( $\chi^2$  (1,  $n = 168$ ):  $p = 0.996$ ). In 2010, farmers had joined forces to cope with njansang related activities with 23.4% of project households working in subgroups, which was significantly different from control households where only 3.4% did so ( $\chi^2$  (1,  $n = 168$ ):  $p < 0.001$ ).

Furthermore, the frequency of collaboration was also higher for project households. This frequency was expressed as the number of times subgroups met during labour-demanding months with regard to njansang activities. Farmers in project villages gathered up to six days a week during periods of high labour demand, collaborating for the most important activity of the subgroups, i.e. collection of njansang fruit. The internal organisation of each subgroup differed, depending on the type of activity and personal working preferences of households involved. For example, when collaborating for njansang fruit collection, some subgroups preferred to gather the same fruit quantity for each participating farmer, regardless the time this took, while other groups spend the same time on fruit collection on each participant.

## 6.4.2 Relational aspects of bonding social capital

### Assessing the quality of relationships

Changes of relationships' quality in project villages were assessed with two proxies, both appreciated on a 3-point Likert-item (Table 6.2). The first proxy, relationship quality within the njansang group, demonstrated a positive change between 2005 and 2010 (Table 6.3). The second proxy, represented relationship changes in the entire village. Here, farmers were almost equally divided over both groups, perceiving 'no change' or a 'positive change', resulting in a mean value of 0.48. The latter proxy at village level was also evaluated in control villages and although control households perceived a slightly positive change (0.27), this value was close to zero, indicating there had been 'no change', and was significantly smaller than the values obtained by project households (Mann-Whitney test,  $n = 168$ :  $p = 0.008$ ). We can therefore conclude that relationship quality improved significantly more in project than in control villages.

On village level, the case of Epkwassong showed very positive social changes



towards relationship quality. No less than 96% of farmers indicated a positive change of the relationships between njansang group members in comparison with other project villages where values between 50-70% were recorded. A similar change was detected at village level, with 88% of farmers indicating a positive change in Epkwassong against 10-50% for all other villages.

### **A closer look at the changed quality of relationships**

The observed relationship changes in project villages were investigated in more detail by considering them from four perspectives (Table 6.3). All changes were evaluated as positive (Table 6.3) whereby especially the change of trust between group members as well as farmers' capacity to deal with conflict score very high. The acquisition of this latter capacity was envisaged by the project to improve njansang group functioning. This versatile capacity was, in addition, also useful in other situations. Thirty-three percent of households claimed to apply this skill in the njansang group, 25% also used it in other groups and a remarkably 87% also applied the techniques to resolve and prevent conflict within their respective households.

Another proxy was the change of assistance (actual or potential) farmers receive from the other group members. The mean value (0.42) of this proxy was slightly positive, although some farmers observed a negative change which was reflected in the high standard deviation. Farmers observing a positive change reckoned that they would receive physical (67%), material (45%) and/or financial (55%) aid if and when they needed it.

Additionally, the change of conflict incidence in the village since the onset of the project was also evaluated. Results indicated a slight decrease in conflict occurrence, although the high standard deviation again implies that opinions varied, whereas some farmers said that conflicts had even increased.

### **Changes at household level**

Project households observed changes within their household's functioning due to project interventions. Figure 6.1 visualizes the positive changes as observed by project households for the five investigated aspects. Note that the majority of households in control villages witnessed no change. Moreover, project households evaluated changes to be significantly more positive than controls (Mann-Whitney test,  $n = 166$ ;  $p$  values  $< 0.01$ ). Overall, changes in household cohesion and organization were the highest, while trust and the position of women were less influenced. Although very little change was detected in control households, the pattern for project and control households was similar except with respect to changes in conflicts within families. As to this latter aspect, controls did not perceive any change

**Table 6.3:** Proxies evaluating the change relational aspects with respect to bounding in project villages. All proxies were scored on 3-point Likert-items, n = 82 (for more detailed information about the proxies one is referred to Table 6.2).

<i>Proxy</i>	<i>Specification of measurement level</i>	<i>Mean value</i>	<i>SD</i>
<b>Bounding-Relational</b>			
Evaluation of relations' quality:	in njansang group	0.67	0.512
	in village	0.48	0.528
Detailed evaluation of relations' quality:			
Trust between farmers	in njansang group	0.85	0.396
Actual and/or potential assistance received	in njansang group	0.42	0.641
Capacity to resolve conflict	in general	0.83	0.383
Relations within the household	in household	0.70	0.463
Number of conflicts in village		0.28	0.690
<b>Bounding-Cognitive</b>			
Proud of village		0.88	0.359
Cohesion, same goals in village		0.78	0.419

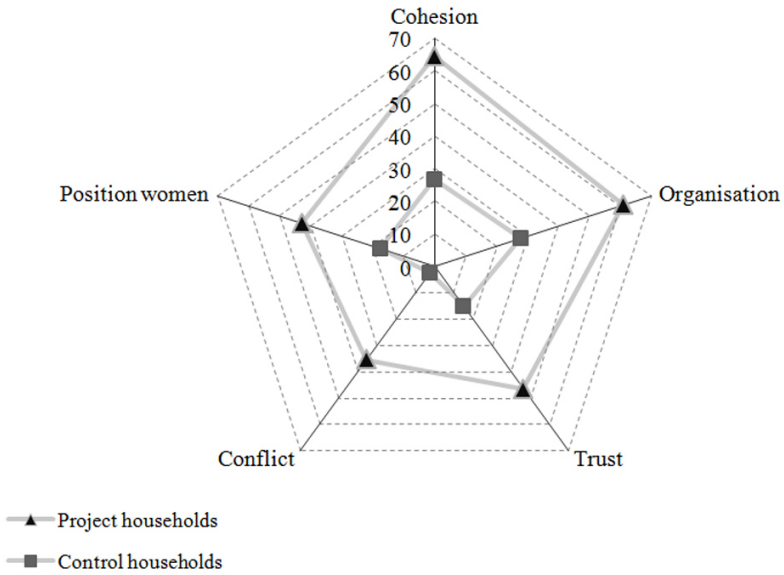
(98% 'no change') while some project households did notice some (35% 'positive' change).

With respect to organization within households, farmers mentioned that more household members had started to participate in njansang-related activities. The number of family members involved increased more in project than in control households (Mann-Whitney test, n = 166: p = 0.024).

Furthermore, few households perceived negative changes and, remarkably, only project households perceived these negative changes (2.4% with respect to trust in the household and 1.2% regarding conflict).

### 6.4.3 Cognitive aspects of bonding social capital

The cognitive proxies, which represent the shared representations and interpretations within the village, changed positively between 2005 and 2010. Farmers had become prouder of their village and they perceived more unity with other villagers. Table 6.3 presents the values for both proxies. They are high, and reflect the changes that had occurred in the project villages.



**Figure 6.1:** Households evaluated changes at household level observing five different aspects presented on the different axes. The percentages represented on the axes are the proportions of households observing a positive change ( $n = 82$ )

#### 6.4.4 Structural aspects of bridging social capital

The structural components with respect to bridging social capital improved more in project than in control households. To assess this, a distinction was made based on whether or not farmers' external professional contacts had been a result of project interventions. The number of external professional contacts, related to njansang commercialization, established without project interference, differed between project and control households ( $\chi^2$  (1,  $n = 168$ ):  $p < 0.05$ ). More project households (43%) had professional contacts with persons from outside the village than controls (25%). In addition, the number of contacts per farmer was higher in project villages (Mann-Whitney test,  $n = 168$ :  $p < 0.05$ ). Thirty percent of project households had more than five professional external contacts, while in control households, no farmer even had this number of external contacts.

Subsequently, the establishment of new professional contacts as a consequence of project interventions was investigated. Of all households interviewed, 56% had established new professional links. These new links were intensively used as 71% of all these farmers affirmed to use them 'several times per year', the option on the Likert-item with the highest frequency. 40-60% of all interviewed households had had no professional contacts before project interventions. In addition, in all villages but one, more than 80% of farmers establishing new professional contacts, were already externally linked without project intervention. Thus, only about 10% of the formerly not-linked farmers had established new professional contacts through project interventions. These results suggest that households who would need to be better linked, i.e. those without any external professional contacts before the project, did not benefit substantially from project interventions. An exception to this observation was noted in Epkwassong where up to 62% of all newly linked farmers had had no professional contacts before. Moreover, in Epkwassong, it was found that the absolute number of contacts created was much higher (>60% higher) and the number of farmers without any links lower (>50% lower) than in any other village. Hence, results show that project interventions had been able to establish professional contacts between the formerly unlinked households, but suggest that it takes time.

#### 6.4.5 Relational components of bridging social capital

Project households evaluated their change of trust with regard to outsiders in general and to traders in particular rather as positive. Change in farmers' trust in outsiders in general increased slightly and was evaluated at 0.28 (SD = 0.591) on a 3-point Likert-item. Farmers' trust in traders, with a value of 0.68 (SD = 0.621), showed a significantly larger increase (Mann-Whitney

test,  $n = 85$ ;  $p < 0.001$ ). The rather high standard deviations was due to the fact that a few people felt their trust decrease.

### 6.4.6 Linking social capital

For linking social capital we refer to Fig. 8.5 which shows that 25 % of project households relied on the development organization for advice on njansang commercialization or related issues. We observed that the main source of information in project villages is the njansang group, while in control villages households rely on other households. The latter households have generally access to information by communicating with external parties, mainly family members or friends living in urban centres. Furthermore, only three percent of all project farmers stated that they had gone to the development organization for issues which had no relation to njansang commercialization nor project interventions.

The relational component of linking social capital was considered good to very good by all farmers. Farmers' only remark was a sometimes delayed/difficult communication with the development organization. They confirmed that this was mainly caused by the periodically very bad accessibility of the roads.

The cognitive dimension of linking social capital indicated that farmers and the development organization shared the same ideas of what successful njansang commercialization should consist of. In chapter 9, these cognitive aspects are discussed more in detail by studying the importance of 27 indicators of farmer livelihoods according to farmers and development organization staff.

## 6.5 Discussion

This study demonstrated that social capital can be successfully generated through external interventions. Results, based on an analysis of proxies, indicated that aspects of bonding and bridging social capital were enhanced in project households. These findings are hereafter elucidated, linked to qualitative data and positioned within related research.

### 6.5.1 The njansang group: a group strengthening old and new relationships

The creation of new producer groups in the villages, which lay at the core of the project's interventions, was important on multiple levels. As a structure, the group provided farmers with an additional organization

to unite, enriching their social network and increasing their number of relationships. Although most farmers indicated that a number of members of the njansang group belonged to other groups they were member of, households were able to make new relationships and were pleased to actually establish a connection with several of their neighbours for the first time.

Barriers that could hamper affiliation to njansang groups were very low as the only requirement was a low admission ( $\pm 1000$  FCFA = 2.14 USD) and yearly membership fee ( $\pm 500$  FCFA = 1.07 USD). This enabled groups to have a broad basis and ensured access of both wealthy and poor households to the group's benefits. In addition, many project villages allowed non-members to participate in group sales for an additional fee. These approaches give njansang groups the potential to grow into important groups at village level. A key example is Epkwassong, where over the years almost all households living in the village became involved in the njansang value chain and joined the njansang producer group.

The structure and functioning of njansang groups differed from that of other groups, such as large religious associations and very small 'tontines', in terms of size, gender composition (involving mainly women), its commercial and capacity building activities and objectives.

Besides participating in the activities of the njansang group, households united in small groups to deal with njansang-related activities more effectively. Ayuk et al. (1999) mentioned already in their study on uses, management and economic potential of *R. heudelotii*, the existence of small groups of women in Cameroon jointly carrying out njansang-processing activities, but this was not a frequent observation. However, this type of small-sized collaboration did exist already for many other activities, leading to a rather small added structural value of these new subgroups.

Nevertheless, the high frequency of collaboration of some households collaborated for some njansang-related activities, such as to limit losses of kernels caused by predating Gambian rats (*Cricetomys gambianus*) and squirrels (*Funisciurus pyrrhopus*), underscores the importance of njansang commercialization and must have had an impact on overall group's cohesion. In addition, besides building social capital, studies have shown that working in small groups can enable farmers to outperform farmers working alone (Vermaak, 2009).

Next to the njansang group featuring a structural importance in the village, it seems to be the relational aspects that make this group particular. At its basis lays the intensification and reinforcement of existing relationships, as well as the creation of new, strong relationships. Farmers often mentioned that to achieve the group's objectives and structure, they

were obliged to work closely together which created strong relationships between members. As a result, proxies evaluating the relational aspect were invariably graded positively. The contribution of the training sessions, provided by a facilitating organization, i.e. ICRAF and partners, should not be underestimated and was reflected in farmers' markedly positive evaluations of the topics discussed such as those on conflict resolution.

Finally, the cognitive aspects of bonding social capital within the group and the village also increased over time. This was not only thanks to the existence of njansang groups and their activities. The presence of a facilitating organization in the village and the frequent visits by its agents and other visitors contributed significantly to this feeling. Farmers felt proud that their village had been 'chosen' to benefit from the project and hence its presence had heightened the status of their village in the region.

### 6.5.2 The downside of external interventions

Although the majority of social outcomes of project interventions were positive, a number of negative aspects were also observed. Conflicts between farmers related to njansang commercial activities actually increased between 2005 and 2010, in particular those related to tree property issues and collection rights. Nevertheless, farmers who received the conflict management training claimed to be more able to deal with these quarrels. Conflicts related to property and collection rights typically appeared in the initial phase of the project because *R. heudelotii* kernels, a formerly open source product, became privatized. This observation for njansang has been described more in detail by Brown and Lassoie (2010). In subsequent years, these conflicts decreased as property rights and rules had been established, which was observed in Epkwassong and Ondeck. Furthermore, other conflicts were village-specific. For instance, in Ondeck, some farmers did not join the group but sold their products via one of the group members. Thus they bypassed the obligatory fees, which created arguments within the group.

Finally, there were conflicts originating from the empowerment of women. Thanks to njansang commercialization, typically done by women (Ayuk et al., 1999), women earned now up to 20% of household's annual total cash income (see chapter 5. This caused conflict in some households because traditionally men earn the cash income in Bantu families by trading cash crops such as cocoa (Degrande, 2005).

### 6.5.3 Training sessions as a pillar for sustainability

Education through training sessions provided by the facilitating organisations provided project households with an increased capacity to successfully commercialize njansang. The importance of proper training in rural development has been stressed by several authors (World Bank et al., 2009; Collett and Gale, 2009). In our study, proxies measuring social capital related to training sessions followed were evaluated more positively than other proxies. Trust between group members and villagers in general as well as their capacity to deal with conflicts improved. This can be attributed to the results of training sessions.

Conflict management was an issue dealt with during training sessions. Results were apparent and its impacts materialized on different levels. First, it improved the functioning within the group. Next, it influenced the functioning of other associations as and groups within the village, and finally it even had an impact at household level. Diffusion of acquired information and skills related to njansang was found to be easier in households than between different groups within the village. This phenomenon was already mentioned by Degrande (2005) who found that collaboration and interaction between groups in a village are generally very weak.

In Loum, conflict training had not yet been organised and this was reflected in the farmers' responses. Comparing this village to the other project villages, Loum had the highest percentage (21%) of respondents indicating an increase of conflicts within the village, and the lowest percentage (7%) mentioning a decrease. This was in strong contrast to Epkwassong where 81% of farmers had observed a positive change. Nevertheless, the higher incidence of conflicts in Loum can also be attributed to the fact that it is still in the start-up phase of the project which implies more ownership conflicts. However, Ebassi is also rather new in the project. And here conflict development was perceived as more positive, as 36% detected a positive change and only 13% mentioned more conflicts. We therefore presume that the difference is linked to training sessions, as during interviews farmers often referred to the recent application of their new skills to understand and handle conflict. In addition, households in Loum are geographically more dispersed which also could have hampered the creation of a coherent group.

To conclude, both quantitative and qualitative data indicated that training sessions stimulated and enhanced changes in social capital. This effect has also been described by other authors (Danida, 2004; Pronyk et al., 2008). Other studies have mentioned the need for farmers to realize benefits from training before they are willing to invest in capacity building (Collett and



Gale, 2009), a precondition which was met in our case study. Moreover, project interventions fulfilled almost all preconditions as mentioned by Collett and Gale (2009), who enumerated the most important features for successful training of women in a similar context. Main features are: 1) accurate and thorough understanding of the living conditions of the women receiving training; 2) projects' and organisations' long-standing commitment to communities to develop high levels of trust; 3) provide training sessions within a group structure, 4) training must fit with women's existing skill levels; 4) providing a variety of training sessions, integrating agricultural training with enterprise training; and 5) presence of short-term improvements to ensure that they understand the value of training. In our study the above features were generally met, which may partly explain the many positive outcomes we were able to show compared to those of some other studies not meeting these preconditions (Gugerty and Kremer, 2000).

### 6.5.4 Building bridges

Proxies related to bridging social capital evolved steadily positively in project villages. This was in contrast to control villages. In control villages we observed that bridging social capital with respect to njansang-related activities did rarely occur and has not changed during the last decade. Control households still sell their product to door-to-door traders (*bayam-sellam*) who visit the villages occasionally.

Project farmers considered the label 'traders' as ambiguous as they distinguished between traders going from door-to-door to buy njansang and traders that had established contacts with farmers via the AFTP4A project. The proxy presented in this study refers to the latter and farmers mention that their trust in these traders increased. At the same time, farmers did not hesitate to express that their trust in door-to-door traders had declined.

Even without counting the contacts established via the project, project and control households had a different number of external contacts. This difference reflects the kind of people involved in njansang commercialisation. That is, trading njansang is typically an activity of the poorer farmers (chapter 5) which was the case in control villages. In project villages, however, households of the wealthier classes got involved as well. Economic development and financial wealth have often been linked to a more advanced degree of social integration (Putnam et al., 1993; Woodhouse, 2006) which was the case in our study whereby the presence of wealthier households with more social links in the project villages, explains the initial different number of external contacts between project and control households.

Moreover, more project than control households had external contacts

besides the ones generated by the project. In addition, it were initially farmers already having external relations who established new professional relations facilitated by the project's interventions. In a later phase of the project, the farmers who hadn't had any external connections also created new external professional contacts.

Hence, it appears that creating bridging social capital takes time, especially to disseminate to the poorer households (cfr. Teilmann, 2012; Lewis, 2010). Bridging social capital has been found to be of major importance to come in contact with additional resources needed to enhance development in general (Granovetter, 1973; Lin, 2001; Teilmann, 2012) and in rural areas in Africa in particular (e.g. van Rijn et al., 2012a). The poor have typically strongly developed bonding social capital (sometimes impeding economic development) but lack bridging social capital (Woolcock and Narayan, 2000). It is thus indispensable for rural development projects to ensure that the creation or enhancement of bridging social capital reaches the target people and shows signs of sustainability, or else all efforts will have been in vain. Considering the short cycles of many development project interventions, this is bound to be a serious challenge.

### **6.5.5 Linking social capital is limited in time**

We found that a quarter of farmers used their connections with the development organization actively at the time the study was performed. Because at the moment of investigation, development organization staff was regularly physically present in the villages, this is no surprising result. However, the development organization approach is such that after the project's intervention period, villages would be able to operate on their own. Hence, project interventions did not focus at all on sustainable linking social capital and the current links that are used currently will very likely cease to exist after the project ends.

### **6.5.6 Success by mutual enforcement**

The successful creation of social capital was linked to the improvement of other farmer livelihood assets. It is crucial for farmers to experience short-term improvements in order for projects to survive in the long-term (Collett and Gale, 2009).

In our study, we observed a mutual reinforcement between social capital and financial capital. On the one hand, social capital was indispensable for njansang group functioning, but on top of that organizing group sales was crucial to increase farmers' revenues. On the other hand, increased financial capital provided households with the opportunity to support other, needy

households and even provide them with loans, thus strengthening the socio-economic relationships in the villages.

Although initially, both social and financial capital were mutually dependent and even reinforced each other, currently, even if financial benefits would disappear and the njansang group would disband, many positive aspects of social capital are likely to sustain. Because many aspects of the acquired social capital assets influenced different aspects of farmers' livelihoods, even within families.

The acquisition of social capital was closely linked to njansang group functioning and, more in particular, skills and understanding they received through training sessions from the project (Table 6.1). Similar results were obtained by Pronyk et al. (2008), who concluded that interventions combining group-based microfinance provision to stimulate income-generating activities and capacity building on gender and HIV issues could enhance many aspects of social capital. The same authors also described the mutual reinforcement of social and financial capital. Additionally, comparison of the different villages showed an increase of social capital with time. This is logic, as social capital is maintained and strengthened by using and applying it regularly (Ostrom, 2000). Furthermore, Cleaver (2005) described that focusing solely on enhancing social capital is often not sustainable and can have negative impacts on livelihoods of the poor.

In conclusion, the findings of this study are in line with those obtained by other authors demonstrating that social capital can be increased through external interventions, notwithstanding its complex nature (Sorensen, 2000; Vervisch et al., 2013; Gugerty and Kremer, 2000).

## 6.6 Conclusions

Our study shows that social capital can be improved through external interventions. In this particular case, social capital was enhanced through the World Agroforestry Centre to promote *Ricnodendron heudelotii* kernel commercialization in rural households in Cameroon. Improvements in social and financial capital were mutually reinforced and effective creation of social capital was, especially in the initial project phase, closely related to the wider framework of promoting njansang commercialization. Hence, we stress that to create effective and sustainable social capital, farmers should experience or at least be aware of other (short-term) benefits with the potential to improve their livelihoods significantly.

Creating a solid social organisation, in combination with short-term benefits for farmers are of major importance to initiate sustainable changes. Furthermore, the importance of the capacity building provided by the sponsoring organization was shown to contribute significantly to the rapid creation of strong social links. The acquired skills were applied under a variety of circumstances also outside njansang groups indicating that changes in social capital are likely to persist over time even when njansang groups would disappear. However, the real added value of development projects lies in creating bridging social capital which is sustainable. Time will tell whether or not this was accomplished in the present study area. Thus, while successful creation of social capital by a development organization is possible if embedded in a wider approach to ameliorate livelihoods, it remains a precarious and complex matter with many challenges yet to be examined.

# Chapter 7

## Natural assets

Promoting *Ricinodendron heudelotii*  
kernel commercialization: effects on kernel  
extraction and the species' regeneration



## Abstract

The present chapter quantified extraction of *Ricinodendron heudelotii* (Baill.) Pierre ex Pax kernels (njansang) in Cameroon and investigated whether a rural development project promoting njansang commercialization influenced this extraction. We also studied spatial tree distribution of this nut-producing species and its regeneration within current land use systems. Participatory tree inventories (110 households, 3208 trees) focusing on njansang collection in 2005 and 2010 were combined with periodic recording of njansang kernels flows in households during a one year period.

Results demonstrated an increased pressure on *R. heudelotii* and its kernels in both project and control villages. In project villages, increases were more apparent with an average of 70% of the all fallen fruits collected in 2010 as compared to 61% in 2005. During this period, the number of trees visited by collecting farmers increased with 50% in project households as compared to 16% in controls. In all households, the average distance to a *R. heudelotii* tree was 1.5 km. Furthermore, current practices do not seem to jeopardize the short-term survival of the species whereas indications for the possibility for a sustainable, long-term exploitation is present.

## 7.1 Introduction

In the 1990s, commercialization of Non-Timber Forest Products (NTFPs) was put forward as a solution to mitigate deforestation and valorize forests economically without jeopardizing their ecosystem functions. The assumption being that NTFP commercialization and thus financial gain would motivate people to protect the resource base. The idea to simultaneously protect nature and improve people's livelihoods was very appealing to conservationists as well as development agencies. As a consequence, NTFP commercialization was promoted as a conservation tool as well as a development strategy in tropical regions throughout the world (Neumann and Hirsch, 2000).

Although straightforward in theory, in practice, limited data is available to confirm this positive ecological impact of NTFP commercialization practices (Wong, 2000). The few existing studies rather observed negative impacts with overexploitation leading to local resource depletion (Jenkins and Oldfield, 1992; Terry and Cunningham, 1993; Hanson, 1992; Clay, 1997; Thomas et al., 2011). Neumann and Hirsch (2000) in a comprehensive literature review on NTFP commercialization state that better understanding of NTFP extraction activities and their ecological impact is crucial for more sustainable commercialization and protection of species and their environment to occur.

Concerns about overharvesting and long-term sustainability of NTFP extraction have also been raised in Cameroon where the commercial value of many NTFPs has increased significantly over the last two decades (Brown and Lassoie, 2010; Tieguhong and Ndoye, 2006). *Ricinodendron heudelotii* (Baill.) Pierre ex Pax kernels are among the most important NTFPs in the humid forest zone of Cameroon (Mollet et al., 1995; Ayuk et al., 1999). The latter are locally known as njansang. Fruits are primarily dispersed through gravity and, when fallen on the ground, are frequently collected by farmers. Processing of the fruits is a labour-intensive activity which involves rotting of the fruit pulp, washing the stony endocarp (nut), cracking of the nut in boiled water followed by (manual or mechanical) extraction of kernels, and finally drying of kernels. Ultimately, kernels are used for domestic consumption or commercialization (Fondoun et al., 1999). Ground kernels are crushed and used as a flavouring agent in food dishes and are especially appreciated in combination with fish (Tchoundjeu and Atangana, 2008; Plenderleith, 2004).

Rising demand for njansang on national and international markets (Manirakiza, 2007) raises concerns about the sustainability of its exploitation, especially because the product is mainly collected from

primary or transitional forests. Very little information is available on this issue. Only Brown and Lassoie (2010) mentioned that intense exploitation of njansang could lead to insufficient juvenile recruitment to sustain future populations. In addition, they mentioned that tree domestication could counteract this. Nevertheless, no concrete data are available to support these hypotheses.

In the present study, we investigated whether the promotion of the commercialization of *R. heudelotii* kernels increases the pressure of farmers on this natural resource. We compared households in villages where njansang commercialization has been promoted through a development project led by the World Agroforestry Centre (ICRAF) and partners with control households in villages where no such interventions have taken place.

The objectives were to compare njansang exploitation characteristics of these two groups of households by 1) quantifying njansang extraction from the environment and its subsequent product flows; 2) measuring the pressure njansang commercialization induced on the natural resource; and 3) studying its impact on regeneration of *R. heudelotii*.

## 7.2 Methods and materials

### 7.2.1 Species info

*Ricinodendron heudelotii* (Baill.) Pierre ex Pax (Euphorbiaceae), is a light-demanding, deciduous and monoecious tree species with a total height that can reach between 20-30 m. The species is distributed from southern Senegal eastwards to Kenya, and southwards to Angola and Mozambique (Tchoundjeu and Atangana 2006).

It occurs most frequently in fragmentized, transition forest patches, thrives in scattered gaps, on forest edges and scrubs and thickets. The species grows gregariously in older farm fallows and has been preserved by farmers in cacao plantations and home gardens because it supposedly improves soil fertility (Plenderleith 2004; Tchoundjeu and Atangana 2006).

Primary fruit dispersal is mainly gravitational but zoochory by bats and hornbills is also observed. Subsequently, fruits or seeds are mainly dispersed by Cuvier's tree squirrels (*Funisciurus pyrrhopus*), Gambian rats (*Crictomys gambianus*) and blue duikers (*Cephalophus monticola*) (Babweteera and Brown, 2009). The latter also state that there are only a few frugivore species interested in *R. heudelotii* fruits and assume this is due to the fruit's fibrous nature which may cause low digestibility. Once the fruits (2-3 lobed, 2x3 cm, indehiscent) drop down, its pulp rots. Afterwards,



the seed can remain dormant in the stony endocarp for a period of more than 2 years (Plenderleith, 2004).

When forest patches are cleared due to natural or anthropogenic causes (e.g. shifting cultivation), germination is triggered, probably through a combination of increased light and temperature (Kyereh et al., 1999), and the *R. heudelotii* seedlings appear in abundance (Taylor, 1960).

For more info on *R. heudelotii*, we refer to chapter 2.

## 7.2.2 Study area

See chapter 4, section 4.1.

## 7.2.3 Sampling population

See chapter 4, section 4.3.

## 7.2.4 Data collection

Data were collected on household level using two methods: 1) periodic records on njansang collection, processing and sale; and 2) participatory tree inventories. Table 7.1 lists the parameters that were measured.

### Periodic records

Flows of njansang picked and commercialized were recorded on a weekly basis. This implied the measurement of njansang quantities in the households through an input-output approach (based on Campbell and Luckert, 2002; Wong, 2000). Quantities were measured with a spring scale. In each village, one, or in some cases, two farmers, were trained as 'data collector', to support the involved households during data recording. To increase consistency, all data collectors were trained via joint sessions. In addition, data collection was externally monitored every two months. An researcher affiliated with ICRAF went to pick up the records a controlled them.

Periodic recording occurred from June 2010 until September 2011. The first three months were dedicated to refining and aligning methodologies. Hence, periodic data for a one year period was gathered and analysed in this study.

After data cleaning, 52 project and 89 control households were retained for analysis. There was a discrepancy between the number of project and control households due to problematic data collection in one of the project village with many blank or missing forms.

**Table 7.1:** Main indicators used to assess impact of njansang commercialization

<i>Topic</i>	<i>Indicator</i>
<i>Pressure on the natural resource</i>	Number of trees per household (n°)
	Number of visits per tree (n°)
	Proportion of fruits collected per tree (%)
	Spatial pressure: distance to trees (m)
	Spatial pressure: time-distance to trees (h)
<i>Njansang flows</i>	Quantity of njansang collected, extracted, purchased, sold, consumed, given away, etc. (kg)
<i>Artificial regeneration</i>	Number of trees (seeds, wildlings, etc.) planted per household (n°)
	Spatial distribution of planting
	Characteristics of plant material
	Management interventions
<i>Natural regeneration</i>	Number of fields with natural regeneration (n°, % of total number of fields)
	Saplings and sub-adults density in a field (n° ha <sup>-1</sup> )

**Participatory tree inventory**

The second data collection tool was participatory tree inventory (Wong, 2000). Unlike what is done in classic forest inventories, it relied heavily on the input of households collecting njansang. We selected household members who (predominantly) collected njansang to participate in the inventory.

Data was collected on the njansang production years 2004-2005 (further referred to as '2005') and 2009-2010 (further referred to as '2010'). Participatory inventories were held in July-August 2011 with a subsample of 20 households per village. Data was collected partly through direct measurements during tree inventory and in an indirect way through retrospective questioning, especially for 2005. After data cleaning, a total of 57 project and 53 control households were retained for further analysis, corresponding to a total of 3208 individual njansang trees.

The inventories consisted of three phases. First, general information was obtained about a specific household's njansang exploitation activities and the spatial distribution of *R. heudelotii* trees from which fruits were collected in 2005 and 2010.

Second, based on this information, all locations where njansang was collected in 2005 and 2010 were visited and characterized. We characterised both the individual trees as well as the fields, land use systems in which they occurred. Parameters for field characterization were: 1) type of land use system [cacao, coffee, annual food crops or fallow (resp. first and second part in shifting cultivation cycle; see Brown, 2006), forest ( $> 10$  year of fallow), homegarden, other]; 2) total surface area of the field (visual/participatory estimate); 3) time-distance to the homestead (walking time (min) from homestead to beginning of a particular field); 4) land use rights and njansang collection rights [household, extended family (nuclear family, households of same bloodline -three generations-, or related by marriage), community, other (based on Diaw, 1997; Brown and Lassoie, 2010)]; as well as 5) information about artificial regeneration of *R. heudelotii* if any (reason for planting, juvenile mortality between 2005-2010). In addition, fields in which, according to the farmer's knowledge, natural regeneration was present, were also visited and characterized to gain more information about the presence and importance of natural and artificial regeneration of the species within households' fields.

In the third phase, all individual trees were visited and the following parameters were measured or estimated: 1) general tree characteristics including GPS coordinates, diameter at breast height (dbh, measured with dbh-tape:  $\pm 1$  cm) and time-distance (time (min) needed to walk to the beginning of the field to a particular tree); 2) number of visits for njansang collection (reflection of njansang collection intensity), quantity of njansang collected (farmer's estimate through a scaling-up approach, taking into which quantity of njansang they gathered on average each visit, multiplied with the number of times they visited the tree to collect njansang, see Campbell and Luckert, 2002) and proportion of fallen njansang fruit collected in 2005 and 2010 (farmer's estimate, weighing exercise: 100% = 20 units; a distinction was made between three parties collecting njansang: household in question, other farmers, and animals/lost); 3) the tree's average annual fruit production capacity (kg; farmer's estimate); and 4) additional data on tree's origin (natural vs planted: wildling, seed, vegetatively propagated; year of planting; arboricultural measures).

## 7.2.5 Data analysis

Data analysis was conducted with SPSS 17. Data of project villages were pooled and tested against pooled data from control villages. Data were compared at household and/or tree level using non-parametric tests.

Periodic data on njansang quantities were summed to obtain annual figures at household level. For spatial analysis, using the haversine formula, which is

used to calculate the great-circle distances between two points on a sphere from their longitudes and latitudes, we calculated the distance between homesteads and trees (e.g. Ely et al., 2006). Furthermore, based on farmers' estimates of njansang quantities collected from each tree, the total amount of njansang harvested per household was calculated.

The following diameter classes were distinguished: saplings ( $\text{dbh} \leq 10$  cm; 2), sub-adults ( $\text{dbh} > 10$  cm  $< 40$  cm) and adults ( $\text{dbh} \geq 40$  cm). The dbh threshold value of 40 cm was selected based on data on first fruiting and flowering available from the present study (Fig. 4; Peres et al., 2003). Tree densities per diameter class were calculated on field level and afterwards pooled per type of land use system. Tree densities within the field type 'forest' could not be measured due to a difficulty in estimating forest surface areas. Hence, tree densities in forest were not available for further analysis.

The relation between njansang collection intensity (proportion of fallen fruits that is actually harvested) and natural regeneration (density of juvenile individuals) was investigated. Natural regeneration densities of *R. heudelotii* were represented by densities of 1) saplings, 2) sub-adults, and 3) sum of the two classes. Harvesting intensity in a particular field was represented by the mean proportion of njansang fruits collected from the field's trees. Thereupon, correlations between the mentioned parameters were calculated.

## 7.3 Results

### 7.3.1 Pressure on natural resource

Both in project and control households, pressure on *R. heudelotii* kernels increased between 2005 and 2010. First, the number of trees from which njansang was collected increased significantly (Table 7.2). Between 2005 and 2010, a median increase of four trees in project households and two trees in controls was observed, although increases were not significantly different between project and control households (Mann-Whitney test,  $n = 110$ :  $p = 0.064$ ).

Second, harvesting intensity increased as both the number of visits per tree and proportion of fruits collected from a single tree increased (Table 7.3 and Fig. 7.1). Both control and project households visited their njansang trees more in 2010 as compared to 2005 (Wilcoxon signed-rank test,  $n(\text{project}) = 791$ ,  $n(\text{control}) = 690$ :  $p\text{-values} < 0.001$ ), but the mean increase was higher in project households (2.8 visits) than in controls (1.0 visit) (Mann-Whitney test,  $n = 1481$ :  $p = 0.007$ ). While the difference in number of visits per tree

**Table 7.2:** Number of trees visited to collect njansang in 2005 and 2010

	Median 2005	Range mid-50 %	p-value* n=108	Median 2010	Range mid-50 %	p-value* n=110
<i>Project households</i>	8	4-17	0.197	11	5-28	0.428
<i>Control households</i>	12	6-21		14	7-32	

	Median change 2005-2010	p-value change 2005-2010**	p-value* n=108
<i>Project households</i>	4	<0.001 (n=57)	0.064
<i>Control households</i>	2	0.001 (n=51)	

\* Mann-Whitney test, \*\* Wilcoxon signed-rank test

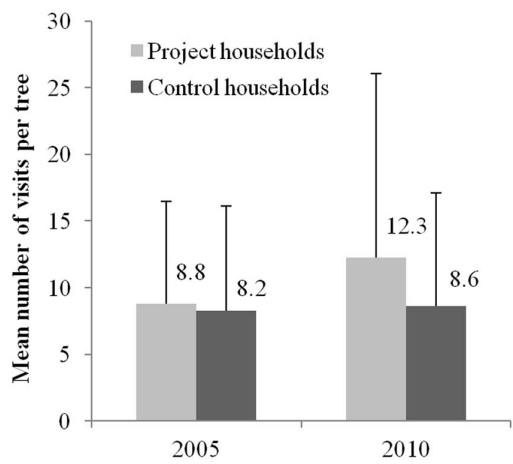
between project and control households was insignificant in 2005 (Mann-Whitney test,  $n = 1481$ :  $p = 0.458$ ), it became significant in 2010 (Mann-Whitney test,  $n = 2266$ :  $p = 0.032$ ). In addition, percentage of collected fruits from a single tree also increased more in project households (Mann-Whitney test,  $n = 1422$ :  $p < 0.001$ ); from similar percentages in 2005 (Mann-Whitney test,  $n = 1422$ :  $p = 0.101$ ) to significantly different percentages in 2010 (Mann-Whitney test,  $n = 2273$ :  $p = 0.019$ ).

Proportion of fruits collected from a particular tree by the interviewed households was summed with the proportion collected at the same tree by other households. This resulted in the total proportion of njansang fruits collected from a particular tree by all farmers. This total proportion of njansang collected from *R. heudelotii* trees was higher in control villages than in project villages (Table 7.4).

Overall, pressure on individual trees increased more in project villages than in control villages, but although the difference with control villages narrowed, the pressure was higher in control villages in 2005 and 2010.

Based on data of collected njansang quantities at tree level, the total quantity of collected njansang per household in 2010 was calculated. Figure 7.2 illustrates the large variability in njansang quantities collected between households. Quantities did not differ significantly between project and control households (Mann-Whitney test,  $n = 110$ :  $p = 0.660$ ).

To assess the spatial component of njansang exploitation, the mean and maximum distances from homestead to njansang trees were calculated for each household ( $n = 110$ ). Results indicate that project households' trees on average were slightly further away than those of control households. However, the differences were not significant (Table 7.5). The mean distance



**Figure 7.1:** Number of visits per njansang tree in 2005 and 2010 (n = 53 in control households group and n =57 in project household group; bars represent standard deviations)

**Table 7.3:** Percentage of njansang kernels collected from a *R. heudelotii* tree by a particular household

	Mean 2005	SD	p-value* n=1422	Mean 2010	SD	p-value* n=2145
<i>Project households</i>	59.3	21.7	0.101	62.7	19.3	0.019
<i>Control households</i>	56.7	24.6		58.6	25.1	

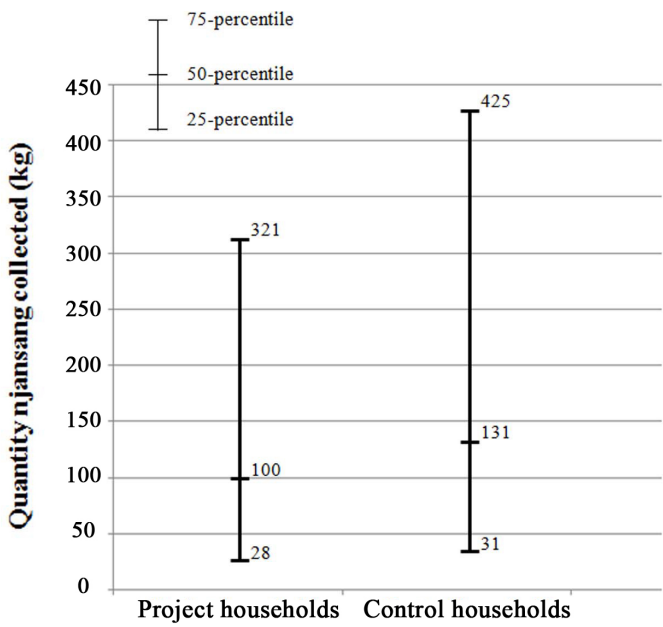
  

	Mean change 2005-2010	SD	p-value change 2005-2010**	p-value* n=1422
<i>Project households</i>	3.4	8.5	<0.001 (n=786)	<0.001
<i>Control households</i>	1.9	3.3	<0.001 (n=736)	

\* Mann-Whitney test, \*\* Wilcoxon signed-rank test

was 1,546 m ( $\pm$  SD 1,508 m) for project households and 1,514 ( $\pm$  SD 1,004 m) for controls in 2010. Similar distances were obtained for 2005.

In contrast to the results from great circle distances, time-distances did differ between project and control households (Table 7.6). In 2005, time-distances were already slightly higher for project villages (although not significantly) but in 2010, this difference became more pronounced and significant. In



**Figure 7.2:** Total quantity of njansang collected per household in 2010 (based on data of njansang harvest from individual trees; for project households n = 886 and for control households n = 654)

**Table 7.4:** Percentage of njansang kernels collected from a *R. heudelotii* tree by all farmers together

	Mean 2005	SD	p-value* n=1422	Mean 2010	SD	p-value* n=2145
<i>Project households</i>	61.1	20.1	< 0.001	70.1	18.4	< 0.001
<i>Control households</i>	73.4	11.5		74.9	14.1	

	Mean change 2005-2010	SD	p-value change 2005-2010**	p-value* n=1422
<i>Project households</i>	8.9	10.5	<0.001 (n=786)	<0.001
<i>Control households</i>	1.2	6.3	0.012 (n=736)	

\* Mann-Whitney test, \*\* Wilcoxon signed-rank test

**Table 7.5:** Mean maximal distance (m) covered, per household, to reach a tree for njansang harvest

	Mean 2005	SD	p-value* n=51	Mean 2010	SD n=53	p-value*
<i>Project households</i>	2013	1249	0.579	2090	1331	0.765
<i>Control households</i>	1830	929		1876	982	

	Mean change 2005-2010	SD	p-value change 2005-2010**	p-value* n=51
<i>Project households</i>	77	889	0.363 (n=55)	0.671
<i>Control households</i>	46	393	0.046 (n=51)	

\* Mann-Whitney test, \*\* Wilcoxon signed-rank test

particular, maximum time-distance increased in project households.

Evaluation of the correlations between tree-specific parameters linked to njansang exploitation at tree level provided some additional insights (Table 7.7). Overall, correlation values were quite low due to the very high variability of the parameters' values.

On the one hand, similarities were found between parameter correlations in project and control villages. For instance, the tree's total fruit production increased with increasing tree size (dbh), and so did the quantities of njansang collected by households. Nonetheless, the negative correlation between tree size and proportion of fruits collected (i.e. relative quantity)



**Table 7.6:** Mean and maximum (max) time-distances (min) to the *R. heudelotii* covered by project and control households to collect njansang

	Mean 2005	SD	p-value* n=51	Mean 2010	SD	p-value* n=53
<b>Mean time-distance</b>						
<i>Project households</i>	42.4	29.0	0.099	48.9	43.4	0.038
<i>Control households</i>	37.5	35.5		34.6	31.7	
<b>Max time-distance</b>						
<i>Project households</i>	70.0	49.3	0.071	85.3	61.6	0.046
<i>Control households</i>	54.3	41.5		53.0	39.3	

	Mean change 2005-2010	SD	p-value change 2005-2010**	p-value* n=51
<b>Mean time-distance</b>				
<i>Project households</i>	6.5	25.1	0.155 (n=55)	0.132
<i>Control households</i>	-2.9	25.8	0.423 (n=51)	
<b>Max time-distance</b>				
<i>Project households</i>	15.2	15.2	0.005 (n=55)	0.131
<i>Control households</i>	-1.3	33.5	0.972 (n=51)	

\* Mann-Whitney test, \*\* Wilcoxon signed-rank test

indicated that household were not able to keep pace with high njansang quantities coming from larger trees.

On the other hand, correlations of tree-specific parameters within project and control villages showed some differences. In project villages, (time-)distance was positively correlated to the quantity of njansang collected. This implies that project households collected more fruits in total from trees that were basically further distant. Combining this finding with a positive correlation between dbh and time-distance indicates that project households covered large distances to find big trees and collect larger quantities of fruits. Trees close to their houses, however, both small and big ones were exploited. This was not the case in controls where a negative correlation was observed between dbh and distance. In addition, distance covered was negatively correlated to quantity of njansang collected. Thus, control households collected from small and large trees everywhere, but collected higher quantities from trees close to their home. In control households, decrease in harvesting intensity with increasing distance to trees was also reflected in high and negative correlations between (time-)distance

**Table 7.7:** Spearman rank correlations of seven parameters related to the njansang exploitation, data on tree level (2010) (n = 432-1890 depending on variables)

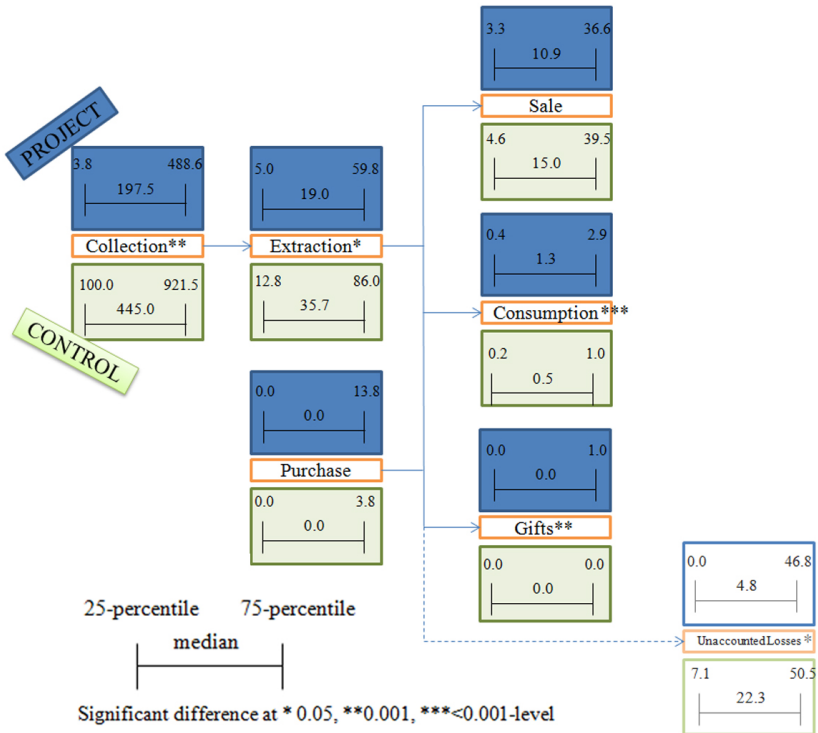
	Distance	DBH	Number of visits	Collected fruit (kg)	Collected fruits (%)	Total fruit production
<b>Project villages</b>						
<i>Time-distance</i>	0.481**	0.181**	-0.081*	0.217**	-0.041	0.207**
<i>Distance</i>		0.042	-0.087*	0.154**	0.131**	0.098*
<i>DBH</i>			0.279**	0.413**	-0.107**	0.429**
<i>Number of visits</i>				0.378**	-0.113**	0.410**
<i>Collected fruits (kg)</i>					0.046	0.954**
<i>Collected fruits %</i>						-0.210**
<b>Control villages</b>						
<i>Time-distance</i>	0.285**	-0.055	-0.164**	-0.109*	0.128**	-0.116*
<i>Distance</i>		-0.118**	-0.230**	-0.116*	0.144**	-0.140**
<i>DBH</i>			-0.090	0.565**	-0.299**	0.608**
<i>Number of visits</i>				-0.121**	0.387**	-0.216**
<i>Collected fruits (kg)</i>					-0.234**	0.951**
<i>Collected fruits %</i>						-0.473**

significant correlation on: \* 0.05; \*\* 0.01 level

and number of times a tree was visited. In contrast to control households, project households increased the number of visits with increasing tree size. Hence, project households sought out highly productive trees which were more frequently and intensively harvested from compared to controls.

7.3.2 Njansang quantity flows

Periodic records of njansang quantity flows in the September 2010 - September 2011 period were quite similar in project and control households (Fig. 7.3). Control households initially harvested higher absolute quantities of fruits and also extracted larger quantities of kernels from the assembled fruits. However, this did not lead to significantly higher marketed quantities (Mann-Whitney test, n = 141: p = 0.468). Furthermore, more project households (95%) consumed njansang themselves than controls (80%) ( $\chi^2$ , p = 0.024) and surprisingly also gave more njansang away (41% and 18% for project and control household respectively,  $\chi^2$  (1, n = 141): p = 0.009). In addition, in control households, greater quantities of njansang were unaccounted for and 'disappeared' from the records after extraction. This discrepancy is probably due to the fact that flows were less carefully followed up in control households.



**Figure 7.3:** The njansang quantity flows (kg) in project and control household over a period of one year (Sep 2010-Sep 2011). In the 'collection' phase, quantities represent fresh fruits, while all other quantities represent njansang kernels, which is the end product (for project households,  $n = 52$  and for control households,  $n = 89$ ; statistical differences between project and control households were tested with Mann-Whitney tests)

### 7.3.3 Natural and artificial regeneration

#### Planting njansang trees

Project households planted significantly more njansang trees compared to controls ( $\chi^2$  (1,  $n = 110$ ):  $p = 0.042$ ). Nevertheless, planting intensity is generally low as merely 14% of all project households actually planted njansang trees, while in control households this was only 4%. The number of trees planted was also very low, not exceeding 10 trees per household in more than 80% of the cases. The majority was planted in 2009-2010 whereas all trees had been planted after project interventions. Half of the planted trees were propagated from seeds, while the other 50% were transplanted wildlings. Trees were mainly planted in fallows (55%) and food crop fields (35%).

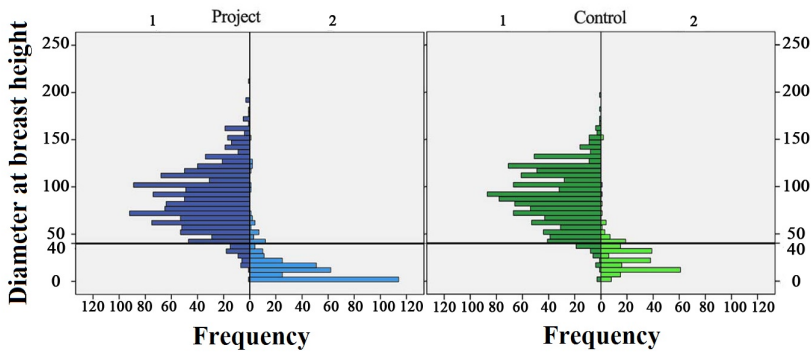
Households mentioned that planting material, i.e. seeds and wildlings, were selected from mother trees that featured the following characteristics: production of high quantities of fruits, large seeds and seeds that crack easily.

The reasons why njansang trees were planted at a particular location were related to the tree's function (e.g. providing shade in cacao plantations) and distance to the homestead: the closer, the better. All trees were planted within 2 km distance from the homestead.

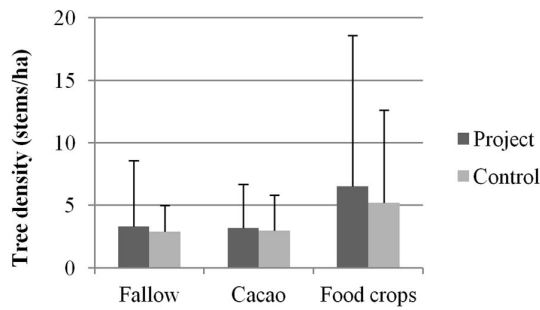
As far as arboricultural practices are concerned, all farmers stated that they regularly cut surrounding vegetation to improve young trees' light conditions. Some farmers mentioned they cut down neighbouring trees and lianas, and sporadically even prune the tree to contain its vertical growth.

#### Natural regeneration

Percentage of fields in which *R. heudelotii* saplings occurred naturally was higher in project villages (9.5%) than in controls (2.9%) (Mann-Whitney test,  $n = 215$ :  $p = 0.010$ ). In project villages, 40% of natural regeneration was situated in fields with annual crops and another 40% in cacao fields. In controls, only a few young trees were found mainly in cacao fields. In general, densities of saplings were higher in project fields than in control fields (Mann-Whitney test,  $n = 54$ :  $p = 0.005$ ). The difference between project and control villages was also reflected in their respective species diameter distributions, reaching a maximum value in the very small diameters classes in project villages (Fig. 7.4). For sub-adults and adult tree densities, as well as for the two combined, no significant difference was found between project and control villages (Fig. 7.5).



**Figure 7.4:** Diameter distribution of *Ricinodendron heudelotii* measured at breast height (dbh) for fruiting (female) trees (2) and not yet fruiting (male and female) trees (1). The black line represents dbh-threshold selected to distinguish between adult trees and regeneration-phase trees (n = 3208)



**Figure 7.5:** Mean tree densities (dbh > 10 cm) in the three main types of land use systems (bars represent standard deviations, total n = 137 )

Considering the ecological characteristics of the species and *R. heudelotii*'s light-demanding character in particular, the main land use types suitable to support regeneration of *R. heudelotii*, are food crop fields and fallows. Data on sapling densities in those two land use types were combined and subsequently project and control fields compared. Sapling densities differed significantly (Mann-Whitney test,  $n = 215$ ;  $p = 0.005$ ) with a mean value of  $0.58 \text{ saplings ha}^{-1}$  in project fields and  $0.01 \text{ saplings ha}^{-1}$  in control fields. The same result was found for sub-adult trees (Mann-Whitney test,  $n = 215$ ;  $p = 0.032$ ) with a mean density of  $1.63 \text{ trees ha}^{-1}$  and  $0.89 \text{ trees ha}^{-1}$  respectively for project and control fields.

### 7.3.4 Harvest intensity and natural regeneration

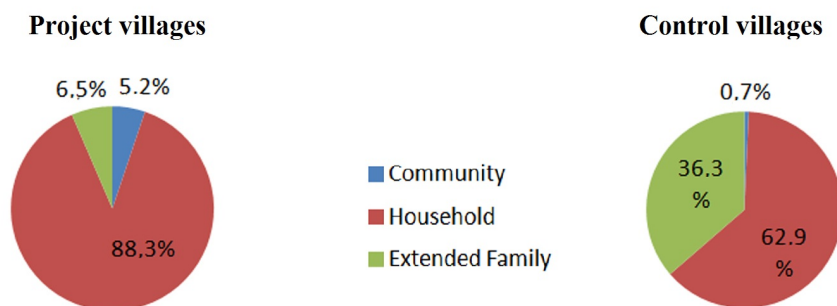
The relation between njansang harvesting intensity (proportion of fallen fruits that is actually collected by farmers) and natural regeneration (densities of saplings, sub-adults and combination of the two) was investigated on field level. The proportion of fruits collected from njansang trees varied considerably between fields ( $0\text{-}100\%$ ; mean  $72\% \pm 16\%$  SD), whereas no significant correlations with natural regeneration were found, for neither project nor control villages. Thus, no direct impact of njansang harvesting intensity on natural regeneration was evidenced.

In addition, the relation between natural regeneration (densities of saplings, sub-adults and combination of the two) and pressure on seed [quantity of njansang (kg) available] was analysed on field level. The latter parameter was based on the sum of farmers' estimates of fruit quantities produced by individual trees in 2010. External input of seeds through seed dispersal from trees outside a particular field was not taken into account. No significant correlations were observed between pressure on seed in 2010 and natural regeneration.

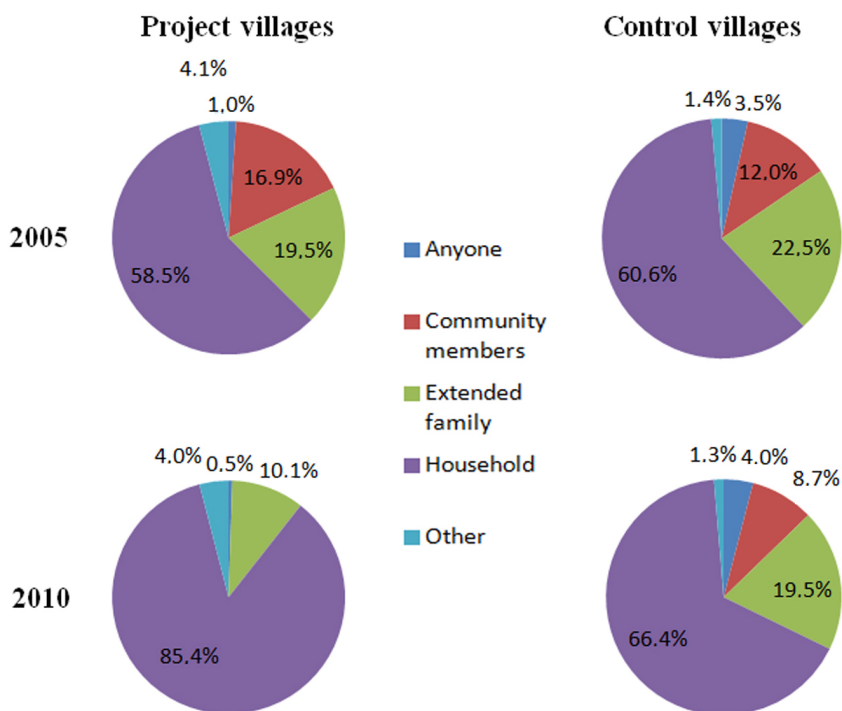
### 7.3.5 Land use rights and njansang collection rights

The majority of *R. heudelotii* trees, under which njansang was collected, were located in fields over which the njansang collecting households had land use rights. Moreover, project households collected almost solely from fields over which they had using rights as a household, whereas control households also visited a large number of trees on sites belonging to their relatives (Fig 7.6). The proportions were significantly different between project and control households ( $\chi^2 (2, n = 231)$ ;  $p < 0.001$ ). Furthermore, njansang was rarely collected on community land. Project households visited slightly more trees on community land as compared to control households.

Figure 7.7 illustrates the changes over the 2005-2010 period of njansang



**Figure 7.6:** Land use rights of fields where njansang was collected in 2010 (data on field level, n = 231)



**Figure 7.7:** Change over the 2005-2010 period of njansang collection rights in fields over which households had productive rights (data on field level, project villages: n = 73, control villages: n = 58)

collection rights in fields over which households had use rights ( $n = 131$ ). In 2005, the situation of collection rights in those fields was similar in project and control villages. The majority of fields was only accessible for household members collecting njansang, while 20% of the fields could also be accessed by other members of the extended family and an in an additional 12-17% njansang collection was allowed for persons living in the community.

In 2010, we observed some gradual changes in control villages, where an additional 6% of the fields became only accessible to household members at the expense of both extended family and community members. In project villages, the observed change was much larger and the fields accessible for njansang collection by all community members entirely disappeared and more than 85% of all fields over which a household had using rights, njansang was only to be collected by household members. The group 'other' which remained the same over time referred to agreements between households of a different lineage about the permission of njansang collection.

## 7.4 Discussion

Between 2005 and 2010, exploitation of *R. heudelotii* kernels intensified in both project and control households. Development interventions, aiming to improve njansang commercialization, thus seemed to accelerate its harvest.

Intensification of njansang extraction as evidenced through number of tree visits and quantities of njansang collected from each tree also had a spatial intensification component, especially in project households. Moreover, the spatial pattern of njansang harvesting differed between project and control households. Project households tended to focus on collection from large, highly productive trees and were willing to cover longer (time-)distances to access them. This is in contrast with control households, that focused on trees closer to the homestead rather than on highly productive trees.

Figures of harvested njansang quantities collected between households showed high variation. This is quite typical for NTFPs and reflects the different degree of involvement in and/or capacities of the interviewed households for NTFP commercialization (e.g. Christensen et al., 2008). Based on our periodic data assessments, total quantities of njansang collected and sold per household per year were rather low. Median values between 20-36 kg njansang collected and 10-15 kg marketed per household per year were lower than the mean values of 20-50 kg njansang marketed, as mentioned by Ayuk et al. (1999). In addition, in our study, at individual tree level results indicated much higher quantities collected annually per household (between 100-130 kg). The same holds true for the data on



quantities collected through semi-structured questionnaires in the same households and for the same year, as reported in chapter 5, who assessed a median of 40 kg of njansang marketed yearly per household. Interannual variation of njansang production might explain some of the observed differences. But, more importantly, it suggests that different monitoring methodologies lead to different results, as was already reported by Menton et al. (2010) in their comparison of diary records and surveys on NTFP-use. Nevertheless, relative differences between project and control households were similar, irrespective of the methodology used. It should be noted that, although project households increased harvest of njansang quantities collected more than controls between 2005 and 2010, control households still collected higher quantities of njansang than project households. This can be explained by the already advanced njansang commercialization status of some control households in 2005, as described in chapter 5.

There is still a large potential of njansang kernel that remains unexploited, as not all fruits from large trees are actually collected. Exploitation and commercialization can thus further be increased by focusing on highly productive trees. This strategy was recommended by Kainer et al. (2007) to increase collection of Brazil nuts in the Amazon. This can be done by more frequently collecting njansang from these trees or installing systems (e.g. traps) to decrease losses by frugivore species.

It can be concluded that njansang harvesting has a non-destructive character, at least in the short-term. This can be explained by the fact that fallen fruits are collected without causing any damage to mother trees. This is in contrast to many other NTFPs where part of the vegetative organs is harvested which, with growing markets, can easily lead to overexploitation (Gaoue and Ticktin, 2007; Terry and Cunningham, 1993; Clay, 1997).

In the long run, however, the sustainability of njansang exploitation is more questionable. Literature suggests that recurrent extraction of fruits and seeds from the ecosystem affects species' regeneration potential. In the long run. This threatens the very existence of any species in its original area (Murali et al., 1996; Arnold and Ruiz Pérez, 2001).

However, isolating the impact of harvesting practices from other factors which influence natural regeneration is difficult. Biotic and abiotic environment factors can have a complex and highly variable combined impact on regeneration patterns (Groenendijk et al., 2012; Neumann and Hirsch, 2000). Scoles and Gribel (2012), for example, observed no effect of harvesting intensity on regeneration of *Bertholletia excelsa* producing Brazil nuts, while Peres et al. (2003) observed a negative effect of Brazil nut extraction on the juvenile population of this species. Groenendijk et al.

(2012) found, in their study on resin tapping from *Boswellia papyrifera* and the impact on its natural regeneration in northern Ethiopia, that it was not harvesting practices as such but other phenomena such as fire, grazing and beetle attacks that threatened juvenile tree populations.

Although all authors agree that excessive fruit collection will harm a species' populations in the long term, thresholds are difficult to set. For example, in the study of Setty et al. (2008) over an 8-year period of amla fruit harvesting in south India (*Phyllanthus emblica* and *P. indofischeri*), a harvest intensity of 60% was found to be sustainable and not to significantly affect natural regeneration. In our study, the proportion of total quantity of fruits collected per tree was about 70%.

Although we did not find a direct impact of njansang collection intensity on natural regeneration, its influence could have been masked by other environmental factors influencing species' recruitment. Moreover, there was a high degree of anthropogenic interference in our study area with a considerable impact on vegetation composition, structure and natural regeneration of any species: many study fields were *R. heudelotii* trees were located were agroforests or represented a stage of the shifting cultivation cycle.

There are indications that under current practices, njansang harvest is sustainable. First, shifting cultivation practices favour the recruitment of *R. heudelotii*, because the species regenerates in forest gaps (Kyereh et al., 1999) and is known to grow easily and abundantly in fallows (Plenderleith, 2004). Shifting cultivation has typically a spatially dynamic small-scaled mosaic structure which provides regularly, spatially and in time, ecological conditions for this light-demanding species (Plenderleith, 2004).

Second, during the participatory inventory, *R. heudelotii* seedlings and saplings of all diameter classes were observed and it was clear that farmers are actively retaining njansang trees in farms. Sapling and sub-adult densities, however, were rather low, which was in contrast with the high densities of adult trees. Mean values of 2.8 trees ha<sup>-1</sup> (dbh > 10 cm) in fallows up to 6.5 trees ha<sup>-1</sup> (dbh > 10 cm) in annual food crop fields, were in the expected range, with a slightly shifted towards the higher values as compared to other studies. For example, van Dijk (1999) found a mean density of 2.1 trees ha<sup>-1</sup> (dbh > 10 cm), with a maximum of 4.1 trees ha<sup>-1</sup> in transition forests, in Bipindi-Akom II region in the South Province of Cameroon. Musoko et al. (1994) observed 5 trees ha<sup>-1</sup> (dbh > 10 cm) in Mbalmayo Forest Reserve in the Central Province of Cameroon. The rather high tree densities of 6.5 trees ha<sup>-1</sup> found in this study in annual food crop fields is remarkable. It reflects an attitude of farmers protecting *R. heudelotii*

trees when fields are prepared for farming purposes.

Mean densities of saplings that are lower than adult and sub-adult tree densities, are not unexpected nor problematic for the future of the *R. heudelotii* population. It is rather a feature of the species' life cycle and its rapid growth as a pioneer species: appearing only in spaces where light is abundant and subsequently growing quickly to survive its competitors, staying only for a short period in the smaller diameter classes. Herrero-Jáuregui et al. (2011) found in their study on *Dipteryx odorata* and *Copaifera reticulata* in Tapajo's National Forest, Brasil, two light-demanding low-density neotropical tree species, similar diameter distributions as in the present study for *R. heudelotii*.

In addition, the abundant presence of natural regeneration is confirmed by farmers who mentioned that they often had to cut down seedlings and saplings to create space for their food crops. Moreover, control farmers stated that the species was abundantly available and found that no additional measures were necessary to ensure its regeneration.

Third, first signs of domestication of the species were observed in this study. Although deliberate planting of njansang still remained rare, more project households than controls had planted wildings or seeds that were selected from mother trees with favourable characteristics. Occasional planting had already been observed by Ayuk et al. (1999) but Shiembo (1994, cited by Plenderleith, 2004) reported that Cameroonian farmers very rarely planted *R. heudelotii*.

Although deliberate retention and planting of young *R. heudelotii* trees occurred, farmers mentioned that some of the older trees they had retained were 'unproductive' and did not bear fruits at all. Not all farmers knew that the species is monoecious and that the 'unproductive' trees are actually male trees. The sex of trees can only be distinguished at the moment flowers appear which is after 7-10 years in open light spaces and much later at more covered locations (Plenderleith, 2004) which, as farmers stated, leads to problems if trees are retained with the purpose of njansang production.

Next to evaluating the impact of the promotion of commercialization of NTFPs on the species' population, its impact on the ecosystem is even more difficult to assess. NTFP harvesting results in competition between humans and animals for forest food. In the case of fruit extraction, it are frugivore species which are generally the most heavily affected (Arnold and Ruiz Pérez, 2001). High intensity fruit removal in the range of 75% of *Euterpe oleracea* fruits in Caxiuanã National Forest, Brazil, has been found to significantly reduce the presence of frugivorous birds (Moegenburg and

Levey, 2003). We should note that in the latter study, fruits were removed from the branches while *R. heudelotii* fruits are only collected after they fell on the ground.

The impact of njansang harvesting on fruit or seed eating species such as bats, hornbills and rodents (Plenderleith, 2004), needs to be investigated but will probably be negligible for the winged species as they typically eat fruits still growing on the trees and only forage on the ground if there is a shortage of food in the canopy or understory (Smythe, 1970). In addition, Babweteera and Brown (2009) who studied frugivory and seed dispersal in tropical rain forests in Uganda, found that njansang was not eaten by many frugivore species. They observed only three important species consuming the fruits: blue duikers, Cuvier's tree squirrels and Gambian rats [the other four tree species (*Balanites wilsoniana*, *Chrysophyllum albidum*, *Cordia millenii* and *Celtis zenkeri*) investigated by Babweteera and Brown (2009) were visited by 10-20 frugivore species]. The impact of njansang collection on frugivore community seems thus small. Moreover, njansang is not the only food source of *R. heudelotii*'s three main fruit predators.

We observed that project interventions and the promotion of njansang commercialization led to an accelerated privatization of *R. heudelotii* trees and the njansang they produce. In project villages the status of njansang changed between 2005 and 2010 from an open access resource to a private resource. A similar observation was made by Brown and Lassoie (2010) who found that *R. heudelotii* trees and its fruits were considered to be common pool resources accessible for everyone in remote areas, while in areas where market opportunities were well developed, mainly in the vicinity of large urban centres, njansang trees were considered to be private property and access was only gained with permission from the 'owner'. In the study of the latter authors, respondents stated that in recent decades, due to increasing realisation of its commercial value, people had begun to limit access to njansang.

## 7.5 Conclusion

Over the last five years, *Ricinodendron heudelotii* kernel commercialization in the Nyong-et-Mfoumou department of Cameroon has increased and led to a higher pressure on this NTFP. Farmers collected njansang from a higher number of trees and increased number of visits per tree collecting higher quantities of njansang. All indicators measuring pressure on the natural resources showed an increase, both in project villages, where njansang commercialization was promoted, as well as in control villages. However,

the pace of change was significantly higher in villages where the product's value chain has been promoted.

An important feature observed in project villages was that farmers selectively retained young *R. heudelotii* trees in their fields. Project farmers deliberately retained *R. heudelotii* seedlings which reflects their long-term interest in njansang commercialization activities as trees bear only fruits after minimum 7-10 years (Plenderleith, 2004). Nevertheless, farmer investments might prove futile as it is impossible to differentiate between the sex of retained trees, which, after more than a decade, might turn out to be unproductive, male trees. In addition, it remains unlikely that retained trees will possess tree or fruit characteristics desired by farmers, such as high fruit production, easy-to-crack nutshells or production of large kernels (e.g. Plenderleith, 2004; Ayuk et al., 1999). Consequently, farmers could be discouraged in the long run when they see that their trees do not produce the desired quantity and/or quality.

Domestication of *R. heudelotii* could be the prime solution to obtain trees with desired traits (Simons and Leakey, 2004; Leakey and Newton, 1994; Van Damme and Scheldeman, 1999). Although variable aspects of *R. heudelotii* domestication have been studied (Mapongmetsem et al., 1999b,a; Fondoun et al., 1999; Fotso Donfagsiteli et al., 2004) and good results have been obtained for vegetative propagation (Shiembo et al., 1997; Nguеле-Oloa, 2000), the practical implementation by farmers remains low.

Hence, tree domestication initiatives of *R. heudelotii* should be encouraged. First, obstacles for farmers planting vegetatively propagated *R. heudelotii* seedlings should be identified and overcome. Second, sensibilization on the advantages of *R. heudelotii* domestication is needed as many farmers stating that *R. heudelotii* grows abundantly and no additional planting is needed, might just not know the added value of domestication.

In addition, one of the main problems is the lack of a germplasm database. Very little is known about the genetic diversity and the different characteristics of *R. heudelotii*. Research is needed to collect descriptors on this specimen and in particular of its fruits and seeds. Ngo Mpeck et al. (2003) even mention the possible existence of trees of which the seed are self-cracking. The existence and domestication of trees with such characteristics could facilitate the seed extraction procedures as they currently exist.

The threat of njansang commercialization leading to overexploitation and local extinction of *R. heudelotii* is very low. First, trees are not damaged during harvest. Moreover, as njansang's value rises, we observed that small trees were protected and nurtured by farmers. Second, high adult-tree

densities are found in the study region, partly because the species has been retained in the past due to its positive effect on soil fertility (Tchoundjeu and Atangana, 2006). In addition, this pioneer species thrives very well in the mosaic landscape created by traditional shifting cultivation and natural regeneration is abundant (Anim-Kwapong and Osei-Bonsu, 2009).

We do see one possible threat for maintaining future populations of *R. heudelotii*, i.e. the agricultural intensification and increase of human activities in the region might significantly decimate the populations of the few frugivore specimen dispersing *R. heudelotii* seeds. The three main frugivore agents of dispersal of *R. heudelotii*'s seeds (Babweteera and Brown, 2009) are already under pressure in the study area: blue duikers and Cuvier's tree squirrels are hunted for consumption and commercialization (bush meat) while Gambian rats are unwanted and trapped because they damage food and cash crops. Their absence could affect seed dispersal and jeopardize *R. heudelotii* populations in the long run. Furthermore, *R. heudelotii* populations could be genetically impoverished in the long run if farmers consequently collect only fruit from trees with specific, desired traits, thus limiting the maintenance of a diverse genepool. Domestication could counteract this by actively selecting vegetative as well as generative reproduction material from high-potential mother trees. To support this, descriptors for *R. heudelotii* should be developed and data on their variety collected.

We conclude that njansang exploitation and commercialization appears to be sustainable in the studied rural environment in Cameroon. As yet, in the current situation and given current land use practices, the species is likely to survive without the need of special protective measures or policies. There is, however, the precondition that a certain proportion of seeds remains in the ecosystem and is dispersed. Nonetheless, domestication of *R. heudelotii* and encouragement of farmers to plant high-quality trees in their farms will enable farmers to (1) work more efficiently; (2) increase the quantity and quality of njansang collected and commercialized; and (3) alleviate *R. heudelotii* populations and the ecosystem in general in the surrounding forests.

# Chapter 8

## Human assets

Impacts of a development project with an economic focus on farmers' human capital



## 8.1 Introduction

The importance of human capital for development has been demonstrated by many authors and is reflected in the rapid expanding literature about this concept as well as the numerous practical examples in the field (Coleman, 1990; Schultz, 1961; Ellis, 1999; Rammonah and Robertson, 2012).

At its origin, the term human capital was introduced to try to explain differences in economic growth between regions and countries. Before the introduction of the idea of human capital, economic growth was solely linked to labour input and physical assets, but these variables were not able to capture much of the variability observed. In the 1960s the awareness arose that human capital, or the importance of people and their individual abilities, could not be neglected. Important work was done by Schultz (1961) and afterwards developed more extensively by Becker (1964). Although at first critically received, the concept proved its value and gained a prominent place within development theories (Schuller, 2000).

Initially, the human capital theory was used in studies with an strong economic background where it was directly linked with economic characteristics and its potential to increase economic returns, individually and collectively (Stroombergen et al., 2002; Schuller, 2000; Croppenstedt and Muller, 2000; Olaniyan and Okemakinde, 2008). Over the last decade, the concept has also been used for social studies (e.g. Gamarnikow, 2003; Lee et al., 2013). This shift can also be observed in the change of the OECD's definition of human capital moving from a purely economical definition to one including social facets (OECD, 1998, 2001).

Currently, human capital is defined by OECD (2001) as '*the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being*'.

The concept was incorporated within a variety of frameworks. One of them is the sustainable livelihoods framework (SLF) (DFID, 1999). Within the scope of this framework, and of rural development and poverty alleviation in general, DFID (1999) states that '*human capital represents the skills, knowledge, ability to good labour and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives*'. Within the SLF, human capital is one of the five pillars of farmer livelihoods. Moreover, human capital is required to make use of the other assets and to achieve positive livelihood outcomes. The importance of human capital to alleviate poverty and improve livelihoods has been demonstrated by several authors (Schuh, 2000; Chilimo and Ngulube, 2011; Grosse and Roy, 2008; Croppenstedt and Muller, 2000).



In NTFP studies, an assessment of human capital has been very rare. Nevertheless, the importance of human capital for NTFP commercialization has been emphasized by researchers remarking that many farmers commercializing NTFP had low levels of education and limited skills and knowledge regarding product marketing and economic affairs in general (Marshall et al., 2006a; Neumann and Hirsch, 2000). Second, NTFP producers and other stakeholders of NTFP value chains identified the improvement of human capital as an important indicator for successful NTFP commercialization (Marshall et al., 2003).

Marshall et al. (2003, 2006a) identified lack of human capital as a constraint for successful NTFP commercialization. Neumann and Hirsch (2000), who performed a comprehensive literature review of NTFP studies, detected a knowledge gap regarding the poor implementation and assessment of '*social welfare*' issues in NTFP studies. They especially refer to '*nutrition, health care or education levels*'. According to these authors, impact on these levels has rarely been assessed properly and has often been equated to change in incomes and thus financial capital. However, Neumann and Hirsch (2000) state that '*higher levels of income are often correlated with such conditions as higher levels of nutrition, but it cannot be assumed to be an unidirectional causal relationship*'.

The present study tries to narrow this knowledge gap by analysing the impact of the promotion of *Ricinodendron heudelotii* kernel (njansang) commercialization in Cameroon on human capital. The objectives of this study are to assess the impacts of promoting njansang commercialization on households' nutrition and health status, education, knowledge and skills, and personal development.

## 8.2 Material and methods

For information on general sampling and data collection approach and timing, as well as the study site, the reader is referred to chapter 4. Below, we will discuss only the aspects directly related to measuring the human assets listed above.

### 8.2.1 How to measure human capital?

Regarding the measurement of the different types of capital, human capital is not among the most straightforward ones. In contrast to physical, financial and to some extent natural capital, it cannot be easily evaluated through direct measurements. As is the case for social capital, human capital must generally be assessed through proxies. But, contrary to social capital, the

indicators to measure human capital are more established and accepted (Boarini et al., 2012; Puri et al., 2007; Fraumeni, 2008; Kwon, 2009). This is particularly the case for indicators for studies on macro-scale, but if a study on micro-scale is to be established, case-specific indicators can vary highly between studies and well-accepted indicators can be difficult to assemble (Stroombergen et al., 2002; DFID, 1999).

In addition, data collection highly depends on the specific study objectives. Therefore, although general indicators are available to measure human capital, specific indicators were to be established for our own study. Furthermore, rather than focusing on change behaviour of exact measures, it may be more appropriate to investigate (relative) variations between different target groups (DFID, 1999).

### 8.2.2 Using proxies

In the present study, we focused on the proxies of human capital which were (possibly) influenced by the specific project interventions. Proxy selection was based on a literature review and on the research-development project's objectives and outline (ICRAF, 2007). In addition, proxies were added and adjusted after the first data collection in 2010, taking into account the study environment's specific situation. These new proxies were subsequently included during data collection in 2011 (see chapter 4).

Table 8.1 lists all proxies used. Many proxies evaluated change of proxies between 2005 and 2010, which was done on 3-point Likert-items. These items could be reformulated as: -1: negative change; 0: no change; and 1: positive change.

Both proxies, self-esteem and autonomy were added to the more common parameters of human capital as listed above. Both parameters were evaluated on a 5-point Likert-items. The two parameters were included because they could have changed due to project interventions whereas their importance for people's personal development has been demonstrated in literature. Doyal and Gough (1991) argue that autonomy, next to health, is one of the two basic human needs. In addition, Marmot (2003) states that all people have a basic need for autonomy and self-esteem. Furthermore, autonomy and self-esteem are important aspects in assessing women's empowerment and gender equality (POPIN, nd).

The approach to measure self-esteem was the following: first, a concise description of self-esteem was given (box 8.1), based on the Rosenberg self-esteem scale (Rosenberg, 1965). Next, farmers had to evaluate their own

**Table 8.1:** Proxies measuring human capital. The 'evaluation period' refers to the year farmers had to provide info on. '2005-2010' indicates that relative change between 2005 and 2010 was evaluated. Data collection took place in 2010 and 2011

<i>Proxies</i>	<i>Evaluation period</i>	<i>Measuring method</i>
<b>Nutrition:</b>		
Njansang consumption (amount)	2005-2010	3L
Total food consumption (amount)	2005-2010	3L + info change qual/quant
Njansang revenues to purchase nutrition	2005 2010	% of total nja income <sup>b</sup> , absolute income data
Time of food purchase with njansang revenues	2010	grain technique
Period of food scarcity	2010	grain technique
<b>Health:</b>		
Hospitalizations: general	2005-2010	3L
influence nja revenues? <sup>a</sup>	2005-2010	3L
number past 2 years	2010	n°
Purchase medication: general	2005-2010	3L
influence nja revenues? <sup>a</sup>	2005-2010	3L
money spent last 6 months	2010	n°
Physical difficulties	2005-2010	3L
<b>Education:</b>		
Financial problems for education	2005 2010	3L 3L
influence nja revenues? <sup>a</sup>	2005-2010	3L
(Better) schooling children through nja rev	2005-2010	3L
<b>Knowledge and skills:</b>		
Received courses	2010	n°
Access to information	2010	n° + source information
<b>Personal properties:</b>		
Self-esteem	2005-2010	5L
Autonomy	2005-2010	5L

<sup>a</sup> refers to the impact of (changed) njansang revenues on the mentioned topic

<sup>b</sup> nja = njansang

3L refers to measurements on a 3-point Likert-item

5L refers to measurements on a 5-point Likert-item

grain technique, cf chapter 5

self-esteem on 5-point Likert-items, for 2005 and for 2010. An analogous approach was followed to assess farmers' autonomy (box 8.2).

**Box 8.1: Description of self-esteem, based on Rosenberg's self-esteem scale (1965):**

*'I think I am a person of worth and that I have a number of good qualities. I am capable of doing things as well as most other people and I have much to be proud of. I take a positive attitude toward myself and on the whole, I am satisfied with myself. I have sufficient respect for myself and I am proud of myself.'*

**Box 8.2: Description of autonomy, based on Weinstein et al. (2012) and Agarwala and Lynch (2006)**

*'I am capable of solving the difficulties I encounter if I try hard enough. I can usually get what I want and can cope with unexpected events. I normally find solutions for my problems while remaining calm.'*

## 8.3 Results

### 8.3.1 Nutrition

#### **Three-point Likert-item evaluating njansang consumption**

Project and control households did not significantly change their njansang consumption habits between 2005 and 2010. The majority (50-60%) of households did not change anything, while other farmers increased (20-25%) or decreased (20-25%) their njansang uptake. Increased consumption was linked to better understanding of the nutritional value of njansang or merely the knowledge that the product can be consumed. Other households mentioned that, because they gather higher quantities of the product, njansang is often present at home and is consequently used in meals. Decreased consumption was always linked to the increased economical value of the product and preference to market njansang rather than to consume it.

#### **Three-point Likert-item evaluating households' nutrition**

Dietary habits between 2005 and 2010, evaluated on a 3-point Likert-item, changed more positively for project households than their controls ( $p =$

0.048). A very small amount of farmers mentioned a negative change of their dietary habits (<8%), in contrast to farmers observing a positive change (42% in project- and 23% in control villages). Positive changes were linked to 1) qualitative changes (34%), such as purchasing new kinds of food which had not been not readily available in their daily diet; or 2) quantitative improvements (36 %), purchasing more food; or 3) both (40%).

**Contribution of njansang income to food purchase**

The contribution of njansang income to purchase food was evaluated. Between 50-70% of households in project and control villages used njansang revenues to purchase at least once food was situated

Table 8.2 shows that in 2005, project and control households used a similar proportion of their njansang income to cope with punctual food shortages. This had changed by 2010, when project households used a significantly smaller proportion of their njansang income to purchase food (Mann-Whitney test, n = 160: p = 0.018).

The absolute amount of money spent on food using njansang revenues (combining total njansang income figures and relative expenditure on food figures) did not differ between project and control households in 2005 (Mann-Whitney test, n = 147: p = 0.160) nor in 2010 (Mann-Whitney test, n = 144: p = 0.095). Although, project households had higher expenditure figures than control households, the difference was not significant.

**Table 8.2:** Proportion of njansang income used to purchase food in %

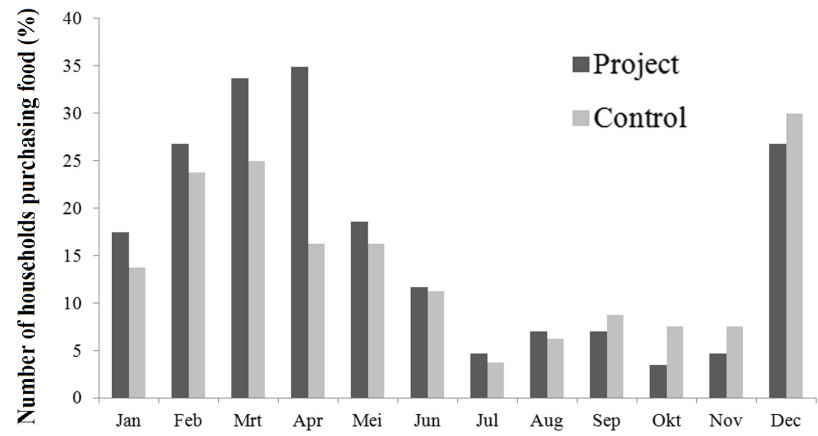
	Mean 2005	SD	Mean 2010	SD
Project households	13.80 <sup>a</sup> (n=82)	17.48	8.64 <sup>b</sup> (n=85)	11.10
Control households	12.56 <sup>a</sup> (n=81)	18.68	11.56 <sup>a</sup> (n=75)	9.67

Different superscripts indicate significant differences between years,  
Wilcoxon signed rank tests

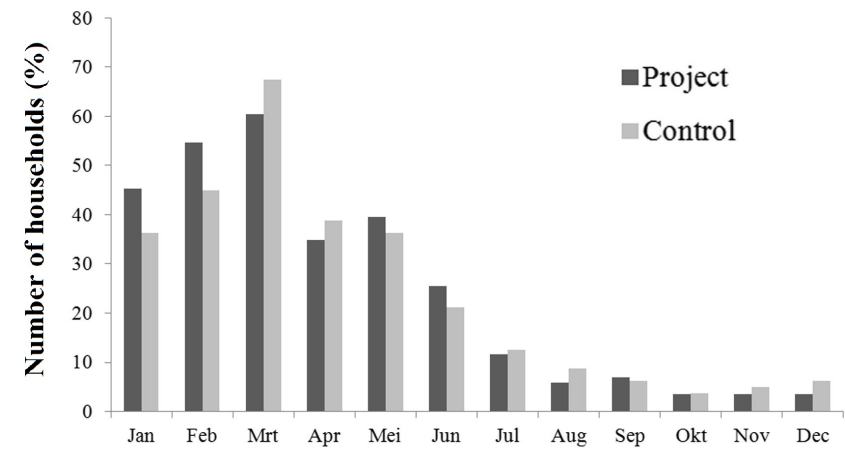
**Period of food purchase**

Next to the relative and absolute data of cash used to purchase food, the period of these purchases provided additional information. Figure 8.1 shows the months during which farmers purchased food with their njansang income whereas figure 8.2 focuses on the months during which farmers witness food

scarcity are displayed. The figures show a similar pattern, indicating that food is essentially bought during periods of scarcity.

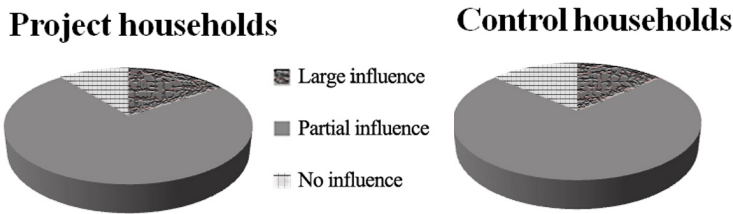


**Figure 8.1:** Months during which households purchase food with njansang incomes in 2010 (n = 163)



**Figure 8.2:** Months during which households suffer from food scarcity (n = 164)

The proportion of households using their njansang incomes to purchase food in months of scarcity did not differ significantly between project (63%) and control households (43%). However, project households buying food



**Figure 8.3:** Perceived influence of njansang incomes to explain change in medication purchase behaviour between 2005 and 2010 ( $n = 161$ )

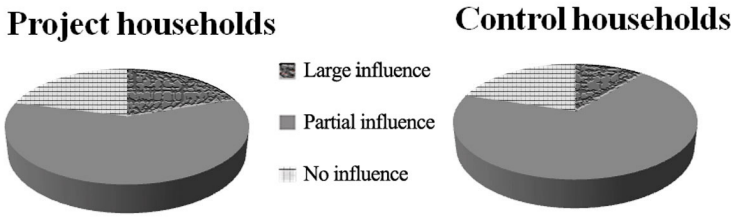
during months of food scarcity, did so during significantly more months as compared to controls, both in absolute (number of months, Mann-Whitney test,  $n = 132$ :  $p = 0.035$ ) and relative numbers (months when food is scarce and purchased/total months when food is purchased, Mann-Whitney test,  $n = 132$ :  $p = 0.033$ ).

In addition, a remarkable difference between figures 8.1 and 8.2 is observed in December. During this month, although there is no food scarcity, large amounts of food were purchased. This is linked to the end-of-the-year celebrations.

The use of njansang revenues to purchase food during months without food shortage was similar in project and control villages.

### 8.3.2 Health

Little significant differences were found between farmers' behaviour towards health issues in project and control villages. The number of times households purchased medication or frequented a hospital did not differ between project and control households. Comparing 2005 and 2010, households stated they bought more frequently medication in 2010 in both project (86 %) and control (81%) villages. Figure 8.3 illustrates the perceived influence of njansang incomes on this change, which did not differ significantly between project and control households. The majority of project households (71%) stated to go more to the hospital in 2010 than they did in 2005, which was significantly higher compared to controls (58%)(Mann-Whitney rank test,  $n = 167$ :  $p = 0.041$ ). However, this difference could not be linked to the availability of higher njansang incomes in project households (Fig. 8.4).



**Figure 8.4:** Perceived influence of njansang incomes to explain change in behaviour towards hospital visits between 2005 and 2010 (n = 161)

It is nevertheless important to notice that njansang incomes did influence (be it only partially) the positive changes of health issues observed between 2005-2010 in both project and control households.

The proportion of njansang income used for health issues balanced between 10-20% (see p. 89). We found higher values (although not significantly) for control households in 2005 and 2010 as compared to project households. Between 2005 and 2010, a significant increase of this proportion was found in project households (Wilcoxon signed rank-test, n = 82: p = 0.046) and not in controls (Wilcoxon signed rank-test, n = 75: p = 0.071).

Project farmers' perceptions diverged with respect to the change of physical difficulties they faced during the whole process of njansang commercialization, from collection to sale. With physical difficulties is referred to the impact of the performed labour on the farmer's body. Forty percent of farmers indicated a decrease of physical difficulties and linked this especially to the locally organized group sales. This pertained farmers that who used to travel to the city for njansang marketing themselves.

Twenty-eight percent of farmers said to feel no change, while 32% felt an increase in effort because of two reasons: first, more njansang was collected, which meant that farmers had to cover larger distances to get the product. Second, farmers previously selling at home to door-to-door traders found difficulties in transporting the product from their home to the location of the group sales, especially in areas where households were geographically dispersed.

Most farmers using the njansang cracking machine stated that it had reduced their physical difficulties. Farmers did not have to cope with the possible injuries when cracking the nuts manually. For a few farmers,



physical difficulty increased due to the distance they had to cover to get with the product to the machine (more data on the njansang cracking machine is found on p. 26).

### 8.3.3 Education

There were no large differences between project and control households regarding impacts of njansang commercialization on children's education.

More than 80% of households stated to have problems to pay school fees, both in 2005 and 2010. No significant change was observed between these years. Nevertheless, many households stated that njansang revenues did contribute to pay these fees, in project (88%) and in control (77%) households. On a 3-point Likert-item, project households evaluated the contribution of njansang revenues to education purposes significantly higher than controls (Mann-Whitney test,  $n = 158$ :  $p = 0.027$ ).

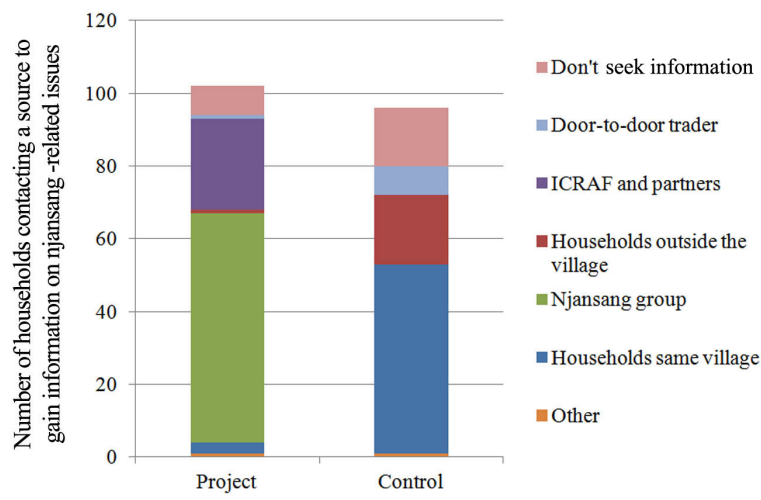
Both project (65%) and control households (61%) stated that they were able to send children to school in 2010, whereas they did not have sufficient financial capacities to do so in 2005. The number of children per household ranged from 1 child (22%) over 2 (30%), 3 (19%) or more (29%) children. Twenty-five percent of all households linked this directly and solely to increased njansang incomes, while 40% confirmed its partial influence, and another 35% stated that njansang revenues had made no difference.

On a 3-point Likert item, verifying whether or not their problems with expenditures for education were resolved, project households answered more positively than controls (Mann-Whitney test,  $n = 158$ :  $p = 0.002$ ). However, more than 50% of project and 75% control households stated that their problems were not resolved.

### 8.3.4 Knowledge and skills

We evaluated the number of training sessions households had received which were related to commercialization of NTFPs in particular and to capacity building in general. On average, project households attended on average four training sessions, provided by external agents, mainly ICRAF and partners, while control households had never received any training (except for one household).

Households in project villages had easier access to information regarding njansang commercialization and domestication due to more frequent communication and physical presence in the village of persons related to the development project. Through this channel, some members of njansang



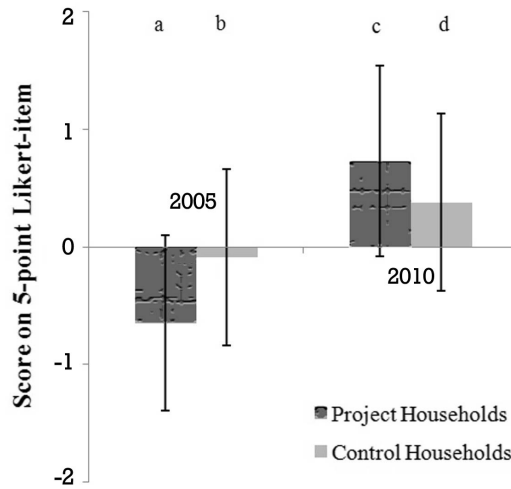
**Figure 8.5:** Persons to whom the interviewed household asked for information about njansang commercialization and/or domestication (n = 163)

groups regularly received new information, which was further spread among all members of each njansang group. It is important to note that only a few persons had direct contact on a regular basis with ICRAF and thus with persons outside of their village.

A similar flow of information was observed in control villages. Here, a few farmers gained information related to njansang commercialization by communicating with external parties, mainly family members or friends living in urban centres (Fig. 8.5). The information acquired was then further shared among other villagers, but probably less rapidly and effectively than in project villages as control villages had no meetings specifically related to njansang commercialization.

In addition, the information received through the development project might be of a better quality and accuracy considering ICRAF's and partners' expertise on the topic.

Some farmers in control villages still relied on door-to-door traders to provide them with information, which was not the case anymore in project villages.



**Figure 8.6:** Farmer's evaluated their self-esteem, based on Rosenberg scale, on a 5-point Likert-item. The Likert-item for self-esteem was divided as: -2) very low; -1) low; 0) normal; 1) high; and 2) very high (different letters indicate significant difference on 0.001 level,  $n = 159$ )

### 8.3.5 Personal properties

In 2005, farmers' self-esteem was lower in project households than in controls. The Likert-item on which self-esteem was evaluated ranged from: -2) very low; -1) low; 0) normal; 1) high; 2) very high. Project households perceived it as 'low' in 2005 whereas it increased to 'high' in 2010 (Fig. 8.6). Control households answered less-pronounced and indicated a 'normal' level of self-esteem in 2005 whereas they rated it as slightly higher in 2010. Thus, perceived self-esteem in project households increased significantly more than in controls (Mann-Whitney test,  $n = 159$ :  $p < 0.001$ ).

Self-perceived autonomy increased also between 2005 and 2010 in project and control households. The increase for project households was significantly larger than for controls (Mann-Whitney test,  $n = 159$ :  $p < 0.001$ ).

## 8.4 Discussion

Domestic consumption of njansang in sampled households did not change significantly from 2005 to 2010. Nevertheless, some farmers decreased

their daily consumption to increase their financial benefits from njansang marketing. Increased international market prices for locally produced and consumed items can jeopardize local, domestic consumption as has been shown in the case of quinoa production in Bolivia where locals became unable to use or buy quinoa due to its booming economic value and reduced availability on the local market (Jacobsen, 2011). However, the prospect of njansang responding to a similar international market as quinoa is not a current issue. Nevertheless, it is recommended to follow up on njansang's consumption patterns if its market value keeps on rising.

Between 2005 and 2010, almost half of the project households claimed they had improved their dietary habits. Diet improvement through food purchase had the characteristics of a gap-filler (Marshall et al., 2006b). This means that farmers used njansang revenues in particular to satisfy their nutritional needs during months of food scarcity.

In project households, this nutritional gap-filling was more common than in control households. These results can be combined with the fact that njansang incomes increased more for project households than controls (chapter 5). Together they indicate that although project households used a relatively smaller proportion of their total njansang income to buy food, they did spend more money on food purchase, especially in periods of scarcity.

Marshall et al. (2006b) and Mutenje et al. (2011) also emphasized the importance of the gap-filling character of NTFPs. In a study region in Cameroon very similar to the one in our study, Degrande (2005) found that households who were not self-sufficient in food bought tubers and cereals in the months of March and April. Degrande (2005) observed that, unless households had extra-agricultural activities (salary or pension, temporary jobs, trade), the period of food scarcity generally coincided with the period of income scarcity, hereby increasing households' vulnerability. In those cases, income from njansang commercialization can contribute to the alleviation of seasonal problems of households.

Both project and control households increased their expenditures for health-related issues between 2005 and 2010. Njansang income contributed partially to this change in all households. In general, project and control households changed similarly and there were only minor indications that positive changes of health-related issues were slightly larger in project households. Margoluis (1994) found in his study, on the association between natural resource use and human health in the Sierra de las Minas Biosphere Reserve of Guatemala, no effect of NTFP commercialization on health indicators such as children's weight-for-height, weight-for-age, height-for-age, mid upper arm circumference, diarrhoea, fever, or acute

respiratory infection. The same author concluded that income generated from NTFPs in their study was used to fill a cash shortfall, not to contribute to improvements in family health and nutrition. For our study, it is difficult to make a hard statement about the actual influence of njansang commercialization on health-related issues.

Regarding education and payment of school fees and materials, njansang incomes did partially contribute, but were not sufficient to cover all costs. Although changes were minimal in both project and control households, more than half of the households did become able to send more children to school. Sixty percent of households stated that this was partially or entirely thanks to increased njansang revenues. Again, changes in project and control households were similar with only minor indications of a larger change in project household.

The knowledge and skills of farmers in project villages improved. However, the used parameter 'received courses' is a proxy and the actual understanding and application of the assessed information was not measured. Nevertheless, there were some indications of the use and dissemination of some acquired skills, e.g. skills related to social capital (see chapter 6).

Self-esteem and autonomy increased in all households, but more in project households. The exact causes of increased self-esteem are not known but a combination of several factors such as new achievements, group dynamics and knowledge and skills acquired might be at the basis. A positive correlation between, for example, education, abilities and self-esteem has been confirmed in other studies (Tootoonchi, 1993; Maruyama et al., 1981), and is assumed to be similar in the present study. The fact that NTFP commercialization can provide women with a greater sense of self-confidence was one of the main conclusions of Marshall et al. (2006b), who investigated 16 NTFP value chains in Bolivia and Mexico.

Several authors stress the need of up-to-date (market) information to obtain successful NTFP commercialization (Marshall et al., 2006b; Padoch, 1992; Neumann and Hirsch, 2000; Ellis, 1999). Lack of information is often indicated as a severe constraint for successful NTFP commercialization (Marshall et al., 2003). Njansang groups are a powerful and effective way to disseminate information and many project households rely on them. Nevertheless, the sustainability of the information flow should be assured as currently, it relies heavily on the input of the research-development organization which is going to cease operations in the near future. However, some information is gained by project farmers contacting traders when organizing group sales.

## 8.5 Conclusions

Njansang commercialization enabled households to increase their human assets for a few indicators but it was not the case for others.

The promotion of njansang commercialization seemed to have a positive influence on nutritional status. The impact of njansang promotion on health and education was less obvious, but effects might be only noticed over longer periods as households claimed they did perceive a positive influence of njansang commercialization on this issue. In addition, the parameters measured in this study were very general and were presumably influenced by other factors than the mere effects of njansang commercialization.

To increase our knowledge on the exact impact of njansang and NTFP commercialization on human health, further research should encompass both direct indicators such as nutrient uptake (cfr. Termote et al., 2012) in addition to indirect, more general indicators of health (cfr. Margoluis, 1994) while taking into account high data variability, other influential factors besides njansang commercialization and longer time frames.

# Chapter 9

## Combining assets

**Who views what? Impact assessment through the eyes of farmers, development organization staff and researchers**



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## Abstract

The present chapter assesses the impact of a rural development project on farmers' livelihoods, as perceived by farmers, development organization staff of the World Agroforestry Centre (ICARF) and researchers. The project evaluated, aimed to increase small-scale farmers' financial benefits by promoting the commercialization of *Ricinodendron heudelotii* (Baill.) Pierre ex Pax kernels (njansang) in the Nyong-et-Mfoumou department of Cameroon. The three parties evaluated the impacts of the project, over the 2005-2010 period, through indicators embedded in the Sustainable Livelihood Framework (natural, financial, human, social and physical assets). Project households were compared with control households. Results show that farmers' and development organization staff's views were aligned regarding the relative importance of the indicators to measure success (with overlaps > 85%). The three stakeholders evaluated changes of farmers' livelihood indicators over the 2005-2010 period on 5-point Likert-items. All three stated that most indicators had improved significantly more in project than in control households (p-values < 0.001). Development organization staff probably overestimated changes induced by project interventions as they perceived significantly larger changes than farmers or researchers (p-values < 0.05). Our study highlights the differences between impact perceived by farmers, development organization staff and researchers, and helps to build the knowledge base of the potential and reliability of participatory evaluation approaches. Furthermore, an approach to assess impacts on people's livelihood is proposed, combining the strengths of participatory evaluation with those of classic evaluation methods.



## 9.1 Introduction

Over the last 30 years, the concept of 'participation' has become a key element in development circles (Bell et al., 2012; O Berg and Månsson, 2011; Hermans et al., 2011). After the concept's appearance on the development scene in the 1970s (Chambers, 1988, 1997), it did not take a long time before participatory methods were adopted by larger donor agencies such as the Food and Agriculture Organisation (FAigO), the UK Department for International Development (DFID) and the United States Agency for International Development (USAID) (Howes 1992, Estrella et al. 2000, Cornwall 2000). Currently, participation is common practice, especially at the research and project design stage, and participatory approaches and tools are widely available (Chambers and Conway, 1992; Chambers, 1994; Maredia, 2009; Chevalier and Buckles, 2013).

However, the use of participatory approaches for a project's monitoring and evaluation are the exception rather than the rule (Estrella et al., 2000). And, when participatory approaches are used, it is often only to a limited and inadequate degree (Bond and Pope 2012). Participatory evaluation emerged as a response to the drawbacks observed in conventional evaluation. Conventional evaluation approaches, relying on the expertise of outsiders in order to enhance objectivity, have been widely discussed and criticised in literature (e.g. Green, 1994; Chambers, 1997; Zukoski and Lulaquisen, 2002). Major criticisms are related to high costs of applying the methods, ineffectiveness in terms of measuring what is important, failure to adequately involve project beneficiaries, an excessive focus on quantification and failure to integrate evaluation in the project cycle and learn from it.

In contrast, participatory evaluation approaches aim to make monitoring and evaluation more responsive and appropriate to people's needs and real life contexts (Estrella et al., 2000). Participatory evaluation makes sure that findings are locally relevant, increases local capacities and self-reliance, improves project sustainability, improves understanding of the development process itself, is more cost-effective, etc. (Abbot and Guijt, 1998; Diez, 2001; Zukoski and Lulaquisen, 2002). Current thinking assumes that in the near future, participatory approaches will become a very important aspect of impact assessment (O Berg and Månsson, 2011; Estrella et al., 2000). Estrella et al. (2000) even state that participation in impact assessment is '*one of the great remaining frontiers and challenges in development*'.

A major aspect which limits the application of participatory approaches in impact evaluations is the uncertainty about the accuracy and reliability of data obtained through many of these methods (Hacking and Guthrie, 2006; Lennie, 2006). Participatory approaches are still prone to many

uncertainties related to e.g. participants' engagement (Bell et al., 2012; Brown, 2012) and contextual socio-economic factors (Hermans et al., 2011), which hampers further dissemination and use of the methodologies in more formal impact studies.

In this chapter we aim to increase the knowledge on participatory approaches and their reliability within impact assessment. To do so, we discuss the impact of a rural development project on farmer livelihoods as perceived by different stakeholders, i.e. farmers, development organization's staff and researchers. The two main objectives of our study are to investigate the alignment and differences in perceptions of farmers, development organization staff and researchers with respect to 1) the different indicators and their importance to measure success of project-related activities; and 2) the impact of the project over the 2005-2010 period, in which 2005 coincides with the period before any project interventions occurred.

In addition, our study provides information on what is perceived to be the impact of a rural development project. It contributes to improving the knowledge base on what works and what does not work in rural development, an area in which sound, science-based evidence is lacking (Savedoff et al., 2006; Kelly et al., 2004; Riddell et al., 1997).

The project referred to in this study focused on the promotion of *Ricinodendron heudelotii* (Baill.) Pierre ex Pax kernel (njansang) commercialization in the moist evergreen tropical forest zone of Cameroon. More info about the project and *R. heudelotii* can be found in chapters 4 and 2 respectively.

## 9.2 Materials and methods

### 9.2.1 Study area

See chapter 4 section 4.1.

### 9.2.2 Data collection

Within the study zone, three villages were selected in which ICRAF and partners had been conducting a marketing project to promote commercialization and domestication of *Ricinodendron heudelotii* trees and its kernels. In addition, three control villages were selected in the same region for comparison. The present study investigated impact of project interventions with a focus on the 2005-2010 period. 2005 represents the year before any project interventions in the villages took place.

Impact was assessed by three parties: 1) farmers targeted by the project; 2) staff of the development organization (ICRAF) who was closely involved and familiar with the project's interventions, further in this study referred to as 'experts'; and 3) independent researchers affiliated to Ghent University, Belgium.

Researchers investigated the impacts of the development project on farmers' livelihoods using ex-post impact assessment methods based on retrospective data collected mainly in Nov-Dec 2010 and Jul-Aug 2011. For this assessment, they used semi-structured household questionnaires ( $n = 158$ ), focus group discussions, wealth-ranking exercises, participatory tree inventories ( $n = 110$ ) and periodic household data collection ( $n = 141$ ). For more information on researchers' data collection methods as well as on the characteristics of project and control villages, we refer to chapter 4 as well as the respective where chapters of the different assets are discussed.

Farmers and experts performed separate evaluations of the project's impact on farmers' livelihoods through focus group discussions with groups consisting of four to six persons. Participating farmers were mainly women (maximum one male participant per group) because njansang commercialization is a typical female activity (Table 4.1; Ayuk et al., 1999). Participants had to have at least 8 years of experience in njansang commercialization. Participating experts were four staff members of the development organisation (ICRAF) who had been closely involved in the interventions in the communities since the beginning of project interventions. Farmer and expert data were collected in July and August 2011. Independent researchers facilitated the focus group discussions and refrained from influencing the answers.

Impacts were evaluated using the Sustainable Livelihood Framework (SLF) (DFID, 1999). This commonly used framework (e.g. Udayakumara and Shrestha, 2011; Ali et al., 2007) is based on the assumption that people require a range of assets to achieve positive livelihood outcomes. SLF distinguishes five main assets (financial, natural, social, human and physical capital). Each change in asset was evaluated through a set of indicators. The indicators selected for this study were based on a combination of indicators used in other non-timber forest product (NTFP) impact studies (e.g. Kusters et al., 2006; Marshall et al., 2003) and local observations of the field researchers. In addition, participants had the opportunity to add indicators during the exercises (Table 9.2 provides an overview of all indicators assessed in this study).

Each group session started with a discussion on how participants perceived successful njansang commercialization and the outcomes it should provide.

Participants did not mention aspects that were not in the list of predetermined indicators, so no additional parameters were added to the framework at this stage. Subsequently, all indicators were discussed one by one with the group. Participants were asked to add topics/indicators that had been overlooked. Again, no additions were proposed. Overall participants seemed to be satisfied with the set of predetermined indicators.

The following group discussion involved an exercise to rate (or weigh) the proposed livelihood indicators according to their perceived importance to measure successful commercialization and the outcomes it should provide. During this exercise, participants had to attribute weights to livelihood indicators by allocating seeds to the indicators in accordance to their importance. We followed a hierarchical approach: at first, the five livelihood assets were rated simultaneously. To do so, the participants had to distribute 50 items (seeds or kernels) over the five assets, giving proportionally more seeds to the assets they perceived to be more important. Subsequently, for each of the five livelihood assets, indicators were rated. Again, farmers disposed of 50 items that had to be distributed over the indicators of which a particular asset was composed. Similar weighing exercises have been used by e.g. Termote et al., 2011 to rate relative importance of wild edible plant characteristics. Finally, participants commented on their ratings providing qualitative information to the field researchers.

During the next exercise, indicator changes that had occurred between 2005 and 2010 and that were directly or indirectly induced by njansang commercialization, were examined. Each indicator was valued on a 5-point Likert-item ranging from; -2: very negative change; -1: negative change; 0: no change; +1: positive change; to +2: very positive change. At the end of the exercise, participants provided additional information explaining their answers [similar scoring approaches were used by Gariba (1995) cited by Estrella and Gaventa (1998), Cameron (2006), Kusters et al. (2006) and Newton et al. (2006); the latter two explicitly dealt with the evaluation of NTFP commercialization].

Experts were only familiar with project villages and basically unaware of the detailed situation in control villages, selected for comparison. Therefore, experts assigned scores of indicator changes that were thought to have occurred between 2005 and 2010 in villages and households in the study region, in general. Experts preferred not to score some of the indicators for the control villages because they were not sufficiently familiar with their situation (Table 9.2).

### 9.2.3 Data analysis

Farmers and experts provided data on 5-point Likert-items while researchers collected data using a set of quantitative and qualitative methods. To allow comparison, data collected by researchers was rescaled to 5-point Likert-items (inspired by Kusters et al., 2006). Researchers assessed indicators in the present study using several proxies. For example, the indicator 'change of njansang income between 2005-2010' was assessed using two proxies: 1) absolute income figures of njansang commercialization; and 2) data of its relative importance for households' total cash income. To combine proxies and obtain an indicator's final value on a 5-point Likert scale, all proxies of a certain indicator were rescaled to Likert-items. Next, their average value was calculated. This average was subsequently rounded to obtain an integer value on a 5-point Likert-item.

Rescaling of individual proxies was based on whether or not proxy changes occurred between 2005 or 2010 (negative change: -; no change: 0; positive change: +), and if change occurred, whether or not there was a significant difference between project and control household (the group where significantly larger changes occurred, received a value of 2, whereas the other group obtained a value of 1; if values did not significantly differ, both groups received a value of 1). For example, over the 2005-2010 period, the proxy 'absolute income from njansang' increased significantly in both project and control households (both project and control households receive a '+'-value), and changes were significantly larger for project households than for controls (project households +2, and control households +1).

With regard to calculating indicators' importance as perceived by farmers and experts, the weight of each indicator was calculated based on the results of rating the five livelihood assets and the rating of the indicators within each asset:

$$w_i = asset_j b_i 100,$$

with:  $w_i$  = weight of indicator  $i$  (%) (with  $i$ : 1-27, for the 27 indicators assessed in this study);  
 $asset_j$  = the proportion of seeds allocated to asset  $j$  as compared to the other assets (with  $j$ : 1 to 5, for the five assets);  
 $b_i$  = the proportion of seeds allocated to indicator  $i$  as compared to the other indicators of the asset it belongs to.

To compare farmers' and experts' perceptions on successful njansang commercialization and the outcomes it should provide, we calculated

the overlap of indicator and asset importance as attributed by these stakeholders. Asset and indicator overlap were calculated based on the proportion that importance values, given by farmers and experts, had in common. In practice, the intersection of the (mean) number of grains attributed to each asset or indicator by both stakeholders was calculated. Next, for the indicators to be combined, these numbers of grains were summed and subsequently divided by the total number of grains used.

To provide an estimate of total change that had occurred in the villages, the weighted summation (total weighted score) was calculated combining all indicators (Triantaphyllou and Mann, 1989). Weighted summation is a common way to perform a multi-criteria analysis which is methodologically sound, effective and transparent (Triantaphyllou and Mann, 1989; Janssens, 2001). In this approach, a linear function is used in which the sum is taken of the relative importance of each indicator multiplied with its score, indicating the occurred change of the indicator between 2005-2010:

$$Total\ weighted\ score = \sum_{i=1}^n w_i s_i,$$

with:  $w_i$  = weight of indicator  $i$  (%);  
 $s_i$  = score representing change of indicator  $i$  in  
 2005-2010 period;  
 $n$  = total number of indicators assessed [in this  
 study  $n=27$ ].

This was applied for weights attributed by experts as well as by farmers. These weights were combined with scores of indicator change as assigned by farmers, experts and researchers.

Non-parametric statistics were used to compare the mainly ordinal data using SPSS Statistics 17.0.

## 9.3 Results

### 9.3.1 Indicator importance: alignment between farmers and experts

During participatory rating exercises, farmers and experts assigned similar scores to the importance of the five different livelihood assets from the SLF (Fig. 9.1). Financial and natural capital were indicated as the most important assets.

The overlap of asset importance, between different stakeholders, was in all cases higher than 84% (Table 9.1). Thus, in general, farmers and experts were well-aligned. Nevertheless, within each asset, experts and farmers emphasized different aspects which was reflected in decreasing overlap percentage within assets (Table 9.1).

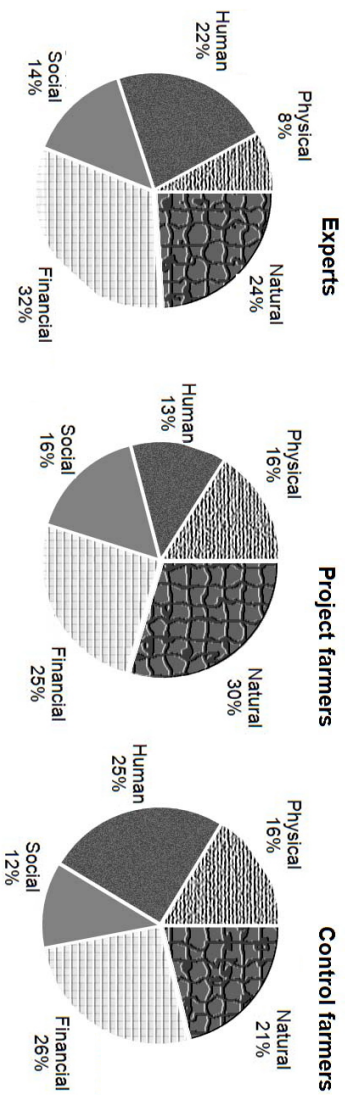
**Table 9.1:** Alignment between indicator importance scores given by experts, control-, and project farmers expressed as percentage overlap between asset scores and indicator scores within each asset

	Overlap (%)		
	Experts & Project Farmers	Experts & Control Farmers	Project Farmers & Control Farmers
<i>Asset overlap</i>			
Five livelihood assets	84.3	88.7	87.1
<i>Indicator overlap within assets</i>			
Natural	81.2	73.4	84.5
Financial	72.4	68.0	92.8
Social	72.0	73.7	86.6
Human	53.6	46.5	88.6
Physical	78.7	96.4	82.3

Regarding the financial assets, experts appeared to attribute higher importance to the income generated by njansang commercialization and its potential to increase savings, whereas farmers in both control and project villages considered all indicators as equally important (Fig. 9.2).

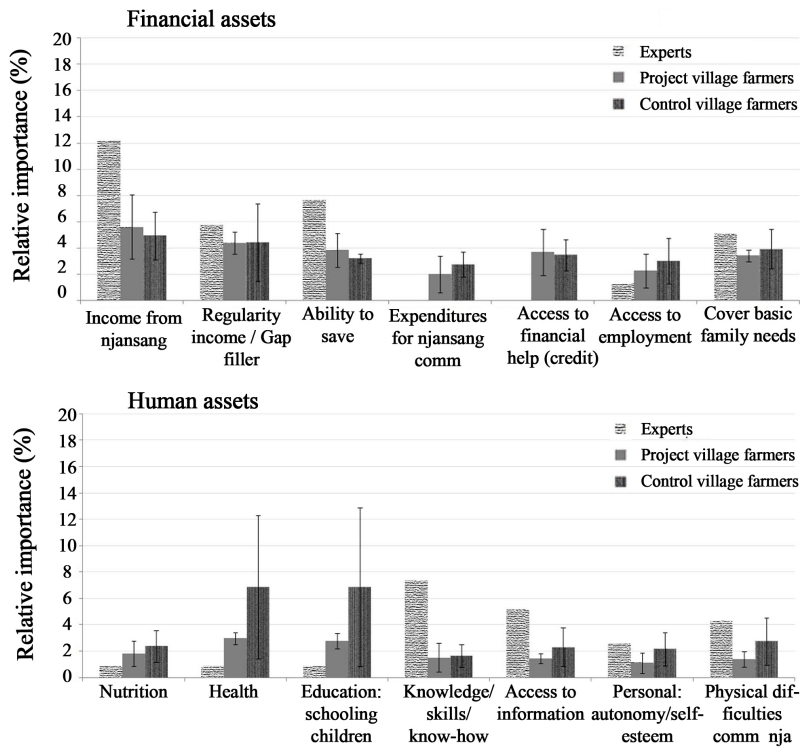
Nonetheless, contrasts between expert and farmer opinions regarding financial assets and income from njansang sales in particular, were reduced when indicators directly derived from njansang income were taken into account. For example, health issues and schooling of children which pertain to human capital, were actually a direct reflection of having sufficient njansang revenues. Whereas experts focused on increased njansang income as such, farmers emphasized already on future spending and consumption possibilities of this income. When all indicators directly related to njansang income were combined, relative importance values of experts, project and control farmers did not differ more than 5%. Hence, farmers and experts were even more aligned than it seemed at first sight.

Human assets were also rated as quite important, especially in control villages (Fig. 9.1). It should be noted that control villages linked this to

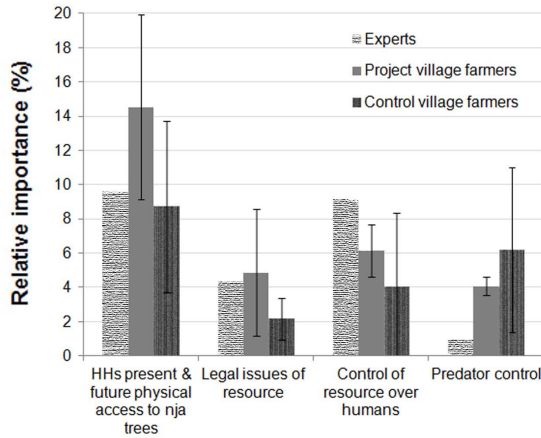


**Figure 9.1:** Relative importance of each of the five livelihood assets with respect to successful njansang commercialization and the outcomes it should provide according to staff of the development organization (experts), and project and control village farmers





**Figure 9.2:** Relative importance of indicators representing financial and human assets. Relative importance of each indicator is expressed against all (27) indicators of the five types of assets of the sustainable livelihood framework



**Figure 9.3:** Relative importance of indicators representing natural assets. Relative importance of each indicator is expressed against all (27) indicators of the five types of assets of the sustainable livelihood framework

benefits at the level of health issues and schooling of children, thus reflecting an income increase from increased njansang commercialization. Experts on the other hand focused on an increase in farmers’ know-how and access to information as a result of capacity building and the implementation of a market information system (Fig. 9.2).

Figure 9.3 illustrates two particular differences between experts and farmers with respect to natural asset indicators. First, project farmers attributed high importance to physical tree access as well as planting and retaining trees for future use. Second, control of njansang against predators was an important factor to farmers, but was mostly neglected by experts.

Divergent views between the different stakeholders with regard to physical and social assets were less-pronounced. In all five assets, indicators which were considered priorities for the development organisation (ICRAF, 2007) were evaluated as more important by experts as by farmers.

### 9.3.2 Development interventions changing project villages: farmers’, experts’ and researchers’ view

Farmers, experts and researchers evaluated change on livelihood indicators as a result of project interventions during the 2005-2010 period. Change was

assessed on 5-point Likert-items and data were pairwise compared between the three parties.

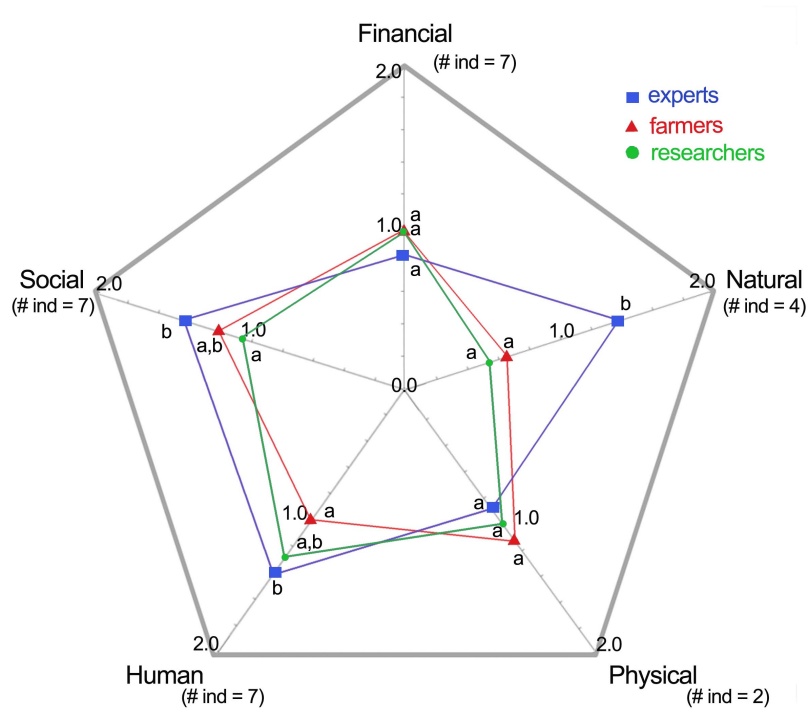
Average indicator scores featured positive values for all five livelihood assets. This indicated that according to farmers, experts and researchers the overall situation in project households had improved over the 2005-2010 period (Fig. 9.4).

Regarding natural assets, experts perceived a significantly larger improvement while farmers and researchers pointed out a more modest result. Financial indicators were evaluated similarly by all parties as a 'positive change'. The same holds for physical asset indicators. High values were observed for indicators of social and human assets, although not all parties were well-aligned about the magnitude of the incurred changes.

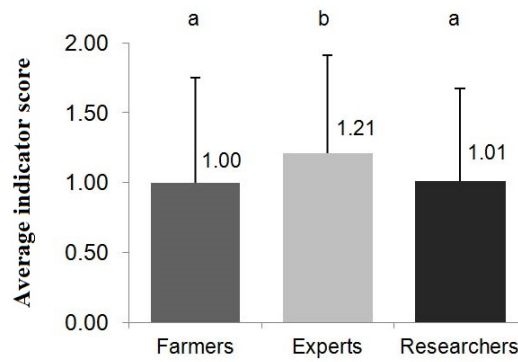
Furthermore, experts assigned the highest score for three of the five assets. A pairwise comparison of all 27 indicators showed that experts gave consistently significantly higher scores than farmers and researchers (Fig. 9.5).

### **9.3.3 Project vs control villages**

A pairwise comparison over all 27 indicators showed that households in project villages improved their livelihoods more than their counterfactuals; farmers, experts and researchers pointed out significant differences ( $p$ -values  $< 0.001$ ). On asset level, some differences were found between the three evaluating parties (Table 9.2). Experts and researchers detected for all assets (except physical asset by experts) significantly larger changes in project than in control villages. However, according to farmers, financial, human and physical assets changed similarly in project and control households.

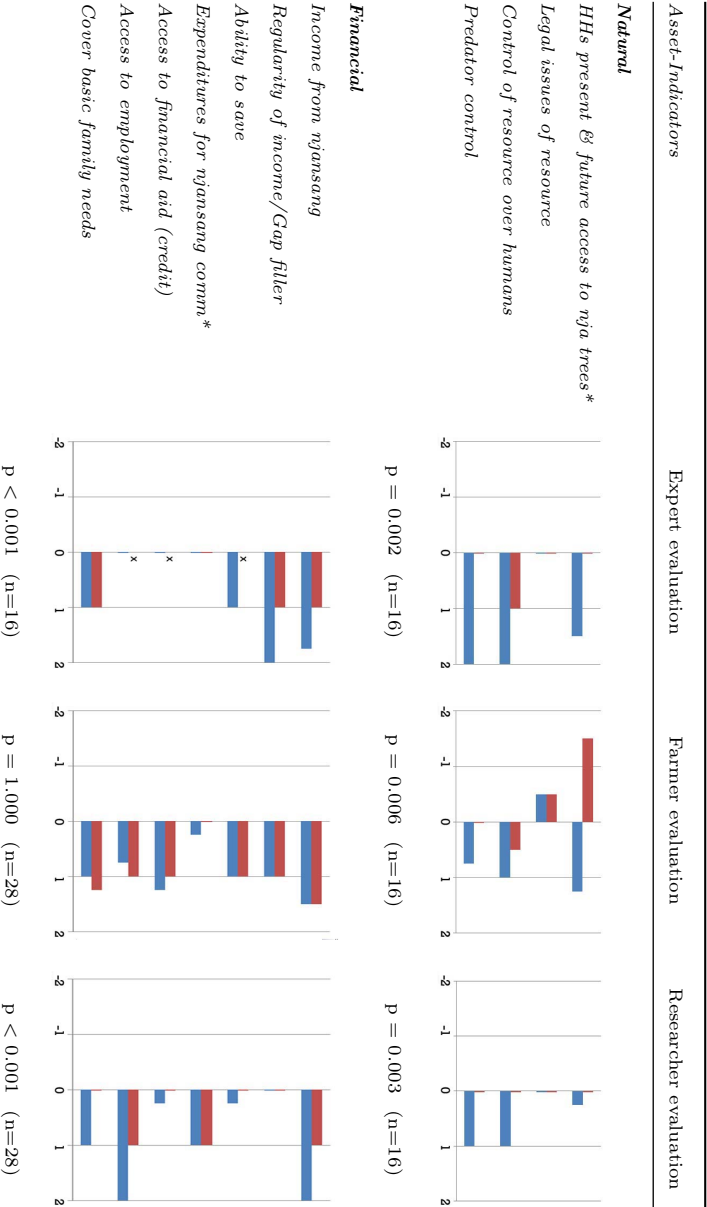


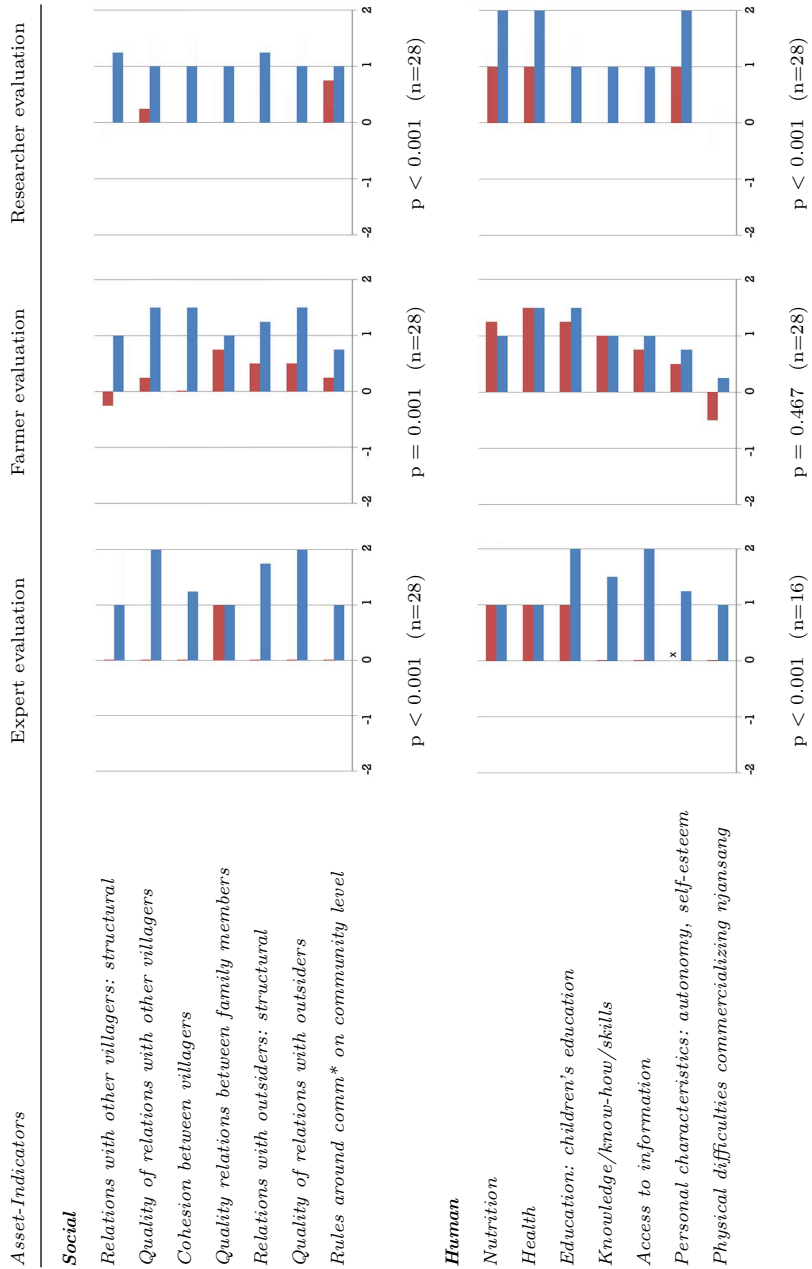
**Figure 9.4:** Average indicator score per livelihood asset. Scores were given by project households (farmers), development workers (experts), and an independent research group (researchers). Scores assessed on 5-point Likert-items and represent perceived change of livelihood indicators over 2005-2010 period (-2: very negative change; -1: negative change; 0: no change; 1: positive change; 2 very positive change) (# ind = number of indicators comprising the asset; different characters represent significant differences for a particular asset)

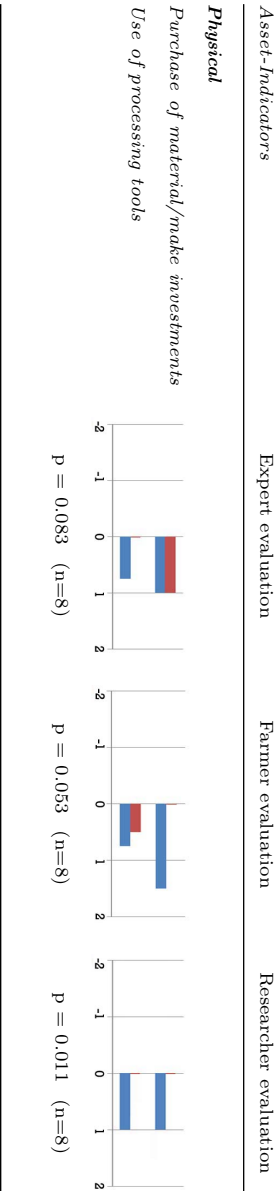


**Figure 9.5:** Average of indicator scores of all 27 livelihood indicators together. Scores were given by project households (farmers), development workers (experts), and an independent research group (researchers). Scores assessed on 5-point Likert-items represent perceived change of livelihood indicators over 2005-2010 period (-2: very negative change; -1: negative change; 0: no change; 1: positive change; 2 very positive change) (bars represent standard deviations; different characters represent significant differences)

**Table 9.2:** Comparison of change of indicators between 2005 and 2010 in project versus control households. Changes of indicators were evaluated by development workers (experts), local target households (farmers) and an independent research group (researchers). They were assessed on change on 5-point Likert-items (-2: very negative change; -1: negative change; 0: no change; +1: positive change; +2 very positive change). Indicators were assessed in all villages and n-values represent the number of indicators per asset multiplied with the number of paired, project-control villages. P-values per asset given are from comparing project vs control households (Paired Wilcoxon test) (for more info on each indicator is referred to the respective chapters in this thesis).

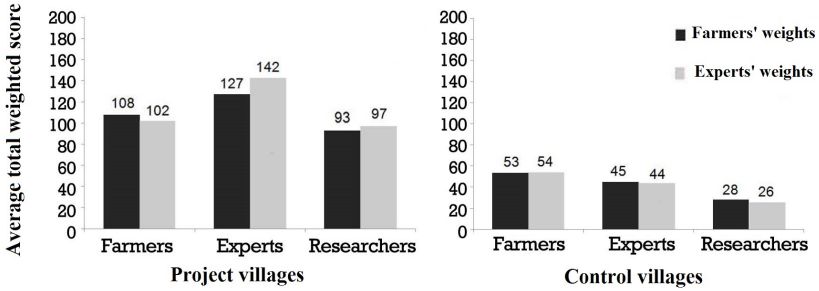






■ = project households, ■ = control households; x: indicator could not be evaluated for controls, not sufficiently familiar with the communities; \*nja= njansang, comm = commercialization





**Figure 9.6:** Average total weight scores providing an overall indication of change as perceived by the different stakeholders for project and control villages [  $Total\ weighted\ score = \sum_{i=1}^{27} w_i s_i$  with  $w_i$  = weight of indicator  $i$  (given by farmers or experts);  $s_i$  = score representing change of indicator  $i$  in 2005-2010 period (assigned by farmers, experts or researchers)] (maximum score = 200)

### 9.3.4 Total weighted scores

Total weighted scores, as illustrated in figure 9.6, were calculated based on the weight of indicators' relative importance and the value indicating indicators' change over the 2005-2010 period (see section 2.3).

Figure 9.6 summarizes stakeholders' overall assessment of perceived changes of indicators over the 2005-2010 period. Experts reported the largest changes and researchers the smallest. Furthermore, there is a large difference between control and project villages. All three parties assigned much lower scores to control villages whereas a very low total weighted score was given by researchers.

Both farmers and experts provided a set of weights of indicators' relative importance. When calculating the total weighted scores, farmers and experts yielded higher scores when their own set of weights were taken into account. This implies that stakeholders were able (or at least perceived so) to successfully make progress in the areas which they had indicated as more important.

## 9.4 Discussion

### 9.4.1 Alignment of measures of success

In the present study, farmers' and development staff's visions on indicators' importance and thus on what is perceived as successful njansang commercialization and the outcomes expected, were well-aligned. Hence, it appears that development organization staff had understood the farmers' needs. This is a reflection of the bottom-up approach as applied by the involved research and development organisation, i.e. the World Agroforestry Centre (Asaah et al., 2011; Tchoundjeu and Atangana, 2006; Facheux et al., 2006; Leakey et al., 2003). As such, this is a valuable result as other authors observed a sometimes problematic contradiction between farmers' preferences and eventual development project interventions (e.g. James, 2010).

Comparison of relative indicator importance, however, did indicate that farmers and experts sometimes emphasize different aspects. These differences were a reflection of different priorities of respective stakeholders. For experts, these priorities, and thus indicator importance values, were strongly linked to project approach and expected outcomes, while farmers focused more on their personal needs. Moreover, experts focused on njansang revenues as such, while farmers had bigger interest in direct consequences of increased njansang revenues and the opportunities they offer for financing household needs. A similar result was found by Vilei (2011) who compared the divergences and congruences between different stakeholders on perceived impact of sustainable farming systems in the Philippines. The latter author applied SLF for the analysis and found that the different stakeholders ranked the five livelihood capitals similarly. In addition, she did find significant differences between stakeholder perceptions at indicator level where farmers tended to rank personal criteria, closely linked to their immediate livelihood needs, as higher. The aforementioned findings by Vilei (2011) were also observed in our own study.

In addition, where farmers visions differed from experts visions, we were able to detect opportunities to improve action to optimize njansang commercialization. Other studies such as those by Kent et al. (2012) and Moswete et al. (2012) confirm that a systematic examination of different stakeholders' perspectives can help to identify overlaps and gaps between stakeholders. For example, in our study, farmers attributed high importance to rodent control, reflecting their concern for njansang losses due to rodent damage, whereas experts had neglected this indicator. Hence, our methodology detected the need for rodent control.

In the present study, human capital indicators related to capacity building and market information and functioning, such as farmers' know-how, skills and access to information, were scored high by experts but surprisingly low by farmers, despite the fact that these factors have been found to be very important for successful commercialization of NTFPs (Neumann and Hirsch, 2000). Many authors confirm that lack of market information prevents local farmers from developing a stronger position in NTFP value chains (Marshall et al., 2003, 2006b; Neumann and Hirsch, 2000). Capacity building and the lack of producers' skills to process and market NTFP have proven to be major obstacles to successfully commercialize NTFPs (e.g. Tieguhong et al., 2009; Marshall et al., 2003; Mog, 2004; Neumann and Hirsch, 2000).

In addition, in the present study project villages attributed even less importance to these indicators than controls. This result is rather unexpected, considering the fact that capacity building and the implementation of a market information system, that provides up-to-date information about njansang prices in several main economic centra, are at the core of the development organisation's approach (Cosyns et al., 2011; ICRAF, 2007). The approach of providing farmers with regular market and price information is, as mentioned by Tieguhong et al. (2009) a key point to improve farmers' positions in NTFP chains in Africa. One could have expected that farmers in project villages should have appreciated the importance of these aspects. A possible explanation could be that in the current system of organizing njansang group sales only a few farmers directly negotiated prices with traders. Thus, the impact of this price setting process might be underestimated by the other farmers, notably those involved in the focus group exercise thus inducing a selection bias.

In the present study, a simple weighing exercise efficiently and effectively detected the differences in alignment between development staff and farmers regarding the outcomes of successful njansang commercialization. This weighing method can be easily implemented as a monitoring tool to keep all parties on the same track, focusing on the same objectives and outcomes (e.g. Hermans et al., 2011). This method can replace or be used in combination with more common techniques such as focus group discussions (e.g. Hamilton et al., 2000).

Impact assessment, as well as the other stages in the project cycle, should include stakeholders' vision and opinion. This argues for a participatory approach (Estrella and Gaventa, 1998; Ridder and Pahl-Wostl, 2005)). In addition, the selection of indicators to measure success should equally be performed in a participatory way (e.g. Blauert and Quintanar, 2000; Schreckenberget al., 2005; Marshall et al., 2006b). This was not sufficiently

featured in the present study. Although the opportunity was given to farmers to add indicators to the predefined set, the initial list of indicators was selected by the researchers, thus limiting the input and participation of farmers in the evaluation process.

#### 9.4.2 Gaining insights into specific villages' challenges

Village-specific information was too limited to allow for any adequate statistical analysis, but provided new insights and revealed opportunities to improve njansang commercialization.

For example, in one of the project villages, named Epkwassong, farmers assigned a high importance value of 10.2% the indicator representing legal issues in comparison to all other villages where values for this indicator did not exceed 4.5%. In Epkwassong, njansang commercialization is the most-advanced of all villages analysed (see previous chapters). Farmers assigning high importance to legal issues is a reflection of the current problems and needs in this village. The problem is that project-driven njansang group sales imply local marketing and subsequent transport of large quantities of kernels. This in turn increases the risks that traders have to pay high unofficial (illegal) taxes at government road control posts when transporting the product. Traders integrate this risk and pay farmers a lower price per kg njansang.

Epkwassong's farmers believe that clear and properly implemented legislation is indispensable to solve this issue and eliminate random demand of unofficial taxes. Weak legal coverage of the NTFP sector in Cameroonian law has also been mentioned in other studies as a major problem for the sector to develop its full potential in a sustainable manner (Ngwasiri et al., 2002; Ingram et al., 2012). The need for a clear legislation to develop sustainable NTFP value chains has been recognized by many authors among which Foundjem-Tita et al. (2013) in Cameroon, Mukul et al. (2010) in Bangladesh and Marshall et al. (2006b) in Bolivia and Mexico.

In Omgbwang, a control village of our study with a long history of njansang commercialisation, the importance of legislation did not surface because of the absence of road controls between their village and the market in Yaoundé. Also in Omgbwang, farmers assigned a value of only 1.1% to the importance of controlling and protecting njansang and *R. heudelotii* trees against other farmers, while the mean value for this indicator for the other villages was 6.0%. This indicated that in Omgbwang conflicts with other farmers were rare. This can be related to the long tradition of njansang trade allowing for the establishment of customary rights with regard to njansang collection and marketing (cf. Brown and Lassoie, 2010).

The use of processing tools was assigned a high importance in Epkwassong (11.8%) and Omgbwang (16.8%) compared to the other villages (mean of 7.2%). Farmers of the first two villages felt the urge to take current njansang commercialization practices a step further by increasing physical capital such as transportation material and collection tools, or by processing njansang to add value to the product.

### **9.4.3 Farmers in project villages advanced faster than their respective controls**

All three parties, i.e. farmers, experts and researchers concluded that farmers in project villages had progressed more than their counterfactuals in the 2005-2010 period. Nearly all indicators assessing farmers' livelihoods were given higher scores in project villages. Financial assets, the most important ones according to farmers and experts, received significantly higher scores in project villages than in controls according to experts and researchers, but not according to farmers. Farmers in both project and control villages thus indicated that njansang commercialization improved financial assets substantially and both assigned high scores to its indicators. However, researchers compared figures of absolute and relative income changes from njansang commercialization over the 2005-2010 period between project and control households and found that project households did increase their financial gains significantly more than controls (chapter 5).

### **9.4.4 Limitations of evaluation change on 5-point Likert-items**

The results above show that the commonly used Likert-items and -scales as well as similar scoring systems on ordinal or interval scales are not able to capture subtle differences between target groups. This is specially the case when the value of an indicator changes substantially in the entire sample, i.e. both in control and project villages, a classic 5-point item will often not be able to capture these differences. Using a Likert-item with more than 5 points could reflect more detail. However, more points make scales less-manageable for respondents. Research shows that Likert-items become significantly less accurate when more than 7 points are used (Johns, 2010). Alternatively, some indicators measured on 5-point Likert-items could be adapted by attributing an absolute indicator value to each of the five points on the Likert-item. These absolute values could be selected through a participatory approach, with farmers deciding for example which absolute value coincides with 'positive increase' or 'very positive increase' on the Likert-item. This could enhance objectivity and comparability between

groups as changes indicated on the Likert-items will be based on the actual values of the different points and not merely on perception. At the same time, this approach will keep indicators compatible with data assessed through classic Likert-items.

In addition, suppose that farmers perceptions of absolute figures are close to the figures used as national and international poverty standards (e.g. points on Likert-item to measure 'increase of income' could be related to the international poverty line of 1.25 and/or 2 USD (PPP) or national poverty lines). If this is the case, the values of these poverty standards can be adopted in order to increase comparability with other studies. However, these approaches still need to be tested before dissemination.

#### **9.4.5 Experts overestimated changes**

We found that development organization staff (experts) applying 5-point Likert-items overestimate changes occurring in the field and the actual impact of some of their interventions. This can have implications on reporting and consequently on subsequent interventions based on these reports. DFID, for example, introduced a new evaluation approach whereby experts have to evaluate actual achievement of expected results on 5-point rating scales. The guidelines for this approach were put forward in the paper 'How to note' in November 2011 (DFID, 2011). DFID states that these scores need to be supported by hard data and figures on indicator values. But the degree to which hard data are required and the direct link with the grading system remains unclear. Besides DFID, many other authors used 5-point scales to estimate changes (Cameron, 2006; Marshall et al., 2003; Ruiz Pérez and Byron, 1999).

Insights into this possible bias introduced by experts scoring outcomes and impacts on a relative scale, is important for the staff of both development and donor organisations. It can have multiple implications which could jeopardize attaining the targeted objectives. For example, if a certain outcome of an objective is erroneously evaluated as very positive, resources for this objective might be cut and reallocated, hampering future progress towards this objective. Another negative aspect can be that impact evaluations commissioned to external parties at the end of a project cycle might result in smaller impacts rating than as those expected by the development organization staff.

### 9.4.6 Perceptions of farmers coincide with results of researchers

We found that farmers and researchers had similar impact perception of the development project studied. They scored the change of livelihood indicators over the 2005-2010 period in a very similar way. This shows that farmer evaluations can provide representative data to assess a project's impacts. Similar results were found by Holck (2008) who studied the cost, accuracy and local reproducibility of three methods for monitoring forest disturbance by local participants in Tanzania. In the latter author's study, researchers and local community members measured forest disturbance using the same methods, yielding similar results. Holck concludes that participatory monitoring is feasible and scientifically sound if methods are simple and cost-effective, and a minimum of capacity training is provided. The methods used in our study meet these conditions.

In addition, actively involving farmers in the different stages of development projects has been shown to result in more positive outcomes and impacts (Thompson and Pretty, 1995; Estrella and Gaventa, 1998; ODI, 1996). Participation of farmers along the evaluation process enhances farmers' ownership of the project (Hermans et al., 2011; Guijt and Gaventa, 1998; Leys and Vanclay, 2011). At the same time, it could reduce financial resources for program evaluation without significantly compromising accuracy of results.

Researchers probably underestimated the changes that took place in control households. Very low scores for control villages (Table 9.2 and Fig. 9.6) are partially a result of the methodological approach applied by the researchers when data were reduced to 5-point Likert-items. Researchers only gave a score of 2 on the Likert-item when there were significant differences between project and control villages. None of the indicators increased significantly more in control villages than in project villages. Therefore, control villages never received a value of +2 on the Likert-item. This led to low researcher scores for control villages which was in contrast to evaluation by control farmers who perceived some changes as very positive by giving a value of +2 on the Likert-items. Also here, part of the solution could be to evaluate indicators using Likert-items whereby each of the point of the Likert-item is attributed an absolute value of the indicator, as mentioned above.

### 9.4.7 A new participatory evaluation approach

To properly assess the multi-dimensionality of farmers' livelihoods, a holistic view which looks at all aspects and assets of farmers' livelihoods and multi-criteria analysis is recommended (DFID, 1999; Kusters et al., 2006; van Rijn

et al., 2012b; de Janvry et al., 2010; Leeuw and Vaessen, 2009). Based on our study, we propose a methodology combining participatory approaches and more conventional rigorous data assessment methods to evaluate a project's impacts. A similar, albeit slightly different approach was suggested by Hamilton et al. (2000). The latter authors propose a methodology based on a minimum set of indicators which should be assessed with an appropriate level of 'scientific rigour' in combination with a participatory self-evaluation approach. In addition, guidelines for impact analysis as proposed by other authors should be taken into account (Maredia, 2009; de Janvry et al., 2010). Many of these guidelines refer to the proper selection of counterfactuals for comparison. Our approach is especially suited to evaluate the impact of development projects and programmes but can also be used for research purposes. We will summarize the general approach hereafter (a more detailed description of this approach can be found in Appendix A).

First, indicators of success need to be selected based on literature, farmers' participation and project's objectives. To select indicators representative for farmers' multidimensional livelihoods, we suggest to use the sustainable livelihood framework as conceptual framework (DFID, 1999; Donovan and Stoian, 2012). Subsequently, importance of indicators can be assessed using a simple weighing exercise as described in the present study. Next, based on these results, a set of highly important 'core' indicators, which need more in-depth study, can be selected. Those indicators need to be studied over time using conventional and broadly accepted methodologies such as field measurements, household surveys or periodical recording. In addition to this set of core indicators, all indicators assessing farmers' livelihoods are monitored and evaluated by the farmers themselves through participatory approaches. An easy way to do this is to let farmers score the present state and/or changes of the indicators on Likert-items. Indicator's state should be assessed before and after project interventions. Also during project interventions, indicator changes could be monitored using a participatory approach (e.g. on Likert-items).

The proposed methodology has the advantages that: 1) it assesses farmers' multi-dimensional livelihoods; 2) is very flexible because the amount of core indicators can be chosen as a function of the objectives, and available resources and time; 3) it uses the strengths of participatory approaches while maintaining rigour for core indicators; and 4) it makes use of the SLF which makes it comparable with many other studies. This also means that its results can be easily used in further meta-analyses to improve our knowledge on what works and what does not work in development.



## 9.5 Conclusions

In our study, we showed some of the added values of looking at the evaluation of a development project through the eyes of several stakeholders. We demonstrated that important obstacles to and opportunities for intervention improvement could be detected through applying a participatory approach, i.e. a simple weighing exercise.

Our study shows that farmer evaluations can provide representative data to assess a project's impacts with a low input of resources, especially when compared to more conventional approaches which usually involve outsiders who are contracted to carry out evaluations at often very high costs (Estrella et al., 2000; ODI, 1996). In addition, participatory evaluation will enhance farmers ownership over the project and will help project sustainability.

We also found that development staff tended to overestimate impacts, which implies that relative scoring systems based solely on development staff's input should be handled with care. In addition, based on our study, we propose a methodology combining the strengths of participatory approaches and more conventional rigorous data assessment methods to evaluate a project's impacts. Finally, we recognize that many challenges remain and much more study is needed on participatory evaluation, but we do think that it will become an important part of future evaluation frameworks.



# Chapter 10

## Conclusions



## 10.1 General conclusions

### 10.1.1 Changing farmers' livelihood assets

The research-development projects, 'Farmer enterprise development (FED)' and 'Increasing small-scale farmer benefits from agroforestry tree products in West and Central Africa (AFTP4A)', funded by the Belgian Development Cooperation (DGDC) and implemented by the World Agroforestry Centre and partners between 2003-2012, had an overall significant, positive impact on farmers' livelihoods in the Nyong-et-Mfoumou department.

We found that the commercialization of *R. heudelotii* (Baill.) Pierre ex Pax kernels (njansang), the project's target NTFP in our study region, increased over the 2005-2010 period in both project and control villages. The percentage of all households involved in njansang commercialization accrued, on average, from 73% to 83% in control villages, and from 30% to 93% in project villages.

With respect to the overall differences between project and control households, we can conclude that in the year of reference, 2005, control households were more integrated into the njansang value chain and had higher benefits from njansang commercialization compared to project households. However, between 2005 and 2010, project households advanced faster than control households. In 2010, project households had reached a similar level for some livelihood indicators, as they performed even better than their counterfactuals for others.

Subsequently, we will provide a brief overview of the impacts of the development project studied on the five types of farmer livelihood assets as distinguished by the SLF.

First, we discuss the impact of njansang commercialization and project interventions on farmers' financial assets. Indeed, improving farmers' financial assets was according to both farmers and development organization staff the main goal of njansang commercialization.

Studies have demonstrated an increased presence of njansang on local, national and regional markets (Manirakiza, 2007; Ndoye et al., 1997; Plenderleith, 2006). Our study showed that also on farmer level, njansang can be of major importance as it can substantially contribute to farmers' cash income. In 2010, project households gained 73 USD (34 200 FCFA) (median) from njansang commercialization, which was 21% of household's total cash income that year. Similar figures were found for control households.

We found that njansang became significantly more important to household's cash income over the 2005-2010 period. Financial assets of project households increased significantly more than those of their counterfactuals, with absolute household incomes increasing with 3 USD (or 18%) more in project households as compared to controls over the 2005-2010 period. A gradual shift was observed from using njansang incomes to fulfil primary, daily needs, to investing these incomes in less-pressing needs such as making small investments and contributing to savings.

However, project interventions and group sales did not lead to higher unit prices during njansang sales. The latter is a prime objective of group sales, and should thus be critically revised. Another observation which should be followed upon is the involvement of wealthier households in njansang commercialization. In 2010, wealthier households had higher profits from project interventions than less-wealthy households so that inequality in the villages was increased. This is not (yet) problematic at the moment, but with time, wealthier households might put poorer households out of business. Moreover, some vulnerable groups such as farmers of age, widows, etc. solely depend on njansang commercialization for their cash income. Promoting njansang commercialization and developing processing techniques should therefore pay special attention to and even prioritize these vulnerable groups.

Human assets were only influenced to a limited degree by njansang commercialization over the 2005-2010 period. Health- and education-related indicators improved slightly both in project and control households, but these changes were only weakly related to increased njansang incomes. The impact on nutrition was that households were able to purchase more food during months of food scarcity. This was especially true for project households. Farmers perceived that their self-esteem and autonomy had gone up over the 2005-2010 period. For the latter two indicators, changes were significantly higher in project households than in controls.

Furthermore, farmers in project villages received a broad range of trainings to enhance their personal skills and knowledge. Although capacity building is a very important aspect to improve farmers positions along products' value chains (Marshall et al., 2006b; Neumann and Hirsch, 2000), project farmers oddly perceived that the newly acquired skills and knowledge were not that important for successful njansang commercialization. This observation might be linked to the way information disseminates in project villages or to the fact that training sessions did not elaborate or emphasize this issue enough (see chapter 8).

Impacts on physical capital were insignificant. Current raise in njansang

incomes did not enable household's to increase their physical assets significantly. Increasing households physical capital was also not a direct goal of project interventions. However, on the long-term, improvements of physical assets should materialize if njansang commercialization is to be a stepping stone out of poverty.

Reinforcing social assets in project villages formed an important aspect of the AFTP4A project approach. The creation of njansang producer groups gave rise to a social framework in which new relations were forged and existing ones reinforced. The observed changes in social assets were strengthened through social capacity building provided by the development organization. In addition, the presence of short-term benefits, e.g. increased njansang income, was also an important aspect to catalyse the improvement of social capital.

Social changes induced by the project, and by capacity building sessions in particular, also caused changes of social assets on household level. Moreover, functioning and organization of other farmer organizations were adjusted based on the newly acquired skills. Hence, the acquired skills were applied under a variety of circumstances, also outside njansang groups. This indicates that changes in social capital are likely to persist over time even when njansang groups were to disappear. Although impacts on social assets were mainly positive, a few households did suffer negative social impacts of project's interventions, such as social exclusion.

Impact analysis of farmers' natural assets showed an increased pressure on *R. heudelotii* trees and their kernels in all households. Between 2005 and 2010, farmers visited more trees for fruit collection whereas each tree was more frequently visited. Higher percentages of fallen fruits were collected, up to 70% of total fruit load. Changes over the 5-year period were larger in project than in control households.

Increased njansang commercialization and increased value of njansang, led to more stringent rules at community level with regard to njansang collection. In general, resource access was restricted to members of the nuclear household and njansang became less accessible to other farmers.

Njansang commercialization seemed not to influence significantly *R. heudelotii* regeneration, however. Current practices do not jeopardize the short-term survival of the species whereas indications of a sustainable long-term exploitation seem to be present. *R. heudelotii* trees and seedlings retained within current land use systems. In addition, first examples of farmers planting *R. heudelotii* were observed. Although tree domestication practices were encouraged in project villages through the installation of

a tree-nursery and training sessions on vegetative propagation and other domestication practices, there were no seedlings planted that were obtained from vegetative propagation experiments.

### 10.1.2 More than just financial gains

For farmers, the main goal of commercializing NTFPs is to increase their financial assets. However, studies have shown that NTFP commercialization, only focusing on financial gains, can have negative effects on farmers' natural assets (Paoli et al., 2001; Ndangalasi et al., 2007) as well as on their social assets (Kusters et al., 2006; Belcher and Schreckenberg, 2007). Rizek and Morsello (2012) conclude in their study that increased involvement in NTFP trade decreases cooperation among households and they even question the seemingly positive outcomes of conservation and development projects based on increased NTFP trade. Neumann and Hirsch (2000) only found case studies of NTFP commercialization demonstrating, at best sometimes neutral, but mainly negative ecological impacts. Hence, if sustainable NTFP commercialization is envisioned and farmer livelihoods are to be strengthened rather than weakened, it is very important to consider all aspects of farmer livelihoods when assessing impact (Neumann and Hirsch, 2000).

The strong emphasis of NTFP commercialization on financial aspects of farmer livelihoods is detected both in scientific literature and in development programs. Many scientific studies only take financial aspects into account when assessing the impact of increased NTFP trade (e.g. Mahapatra et al., 2005; Fu et al., 2009b). Furthermore, most development programs and projects focus on farmers' revenues without really taking into account other livelihoods assets.

In the outline of the AFTP4A project, focus was clearly on the impact on farmers' financial assets. The impact project interventions would have on the other assets of farmers' livelihoods was barely mentioned (ICRAF, 2007).

Nevertheless, one of the strengths of the project discussed is exactly related to the impact it had on the diverse portfolio of farmer livelihoods assets. The project focused on changing institutions and processes on farmers scales by reinforcing social, human and natural assets along with the improvement of financial assets. For example, the formation of a njansang producers' group strengthened social assets; the tree domestication aspect improved natural assets; and the many training programs and skills taught, contributed to human assets. The project did not focus on the direct impact of these interventions on farmers livelihood assets, but rather on the impact they

would have on the project's main goal: increasing and diversifying farmers' income. Nevertheless, the applied project approach contributed positively to the different livelihoods assets farmers possess. Moreover, our results show that it was the combination of improving the different assets which made the project successful and, even more importantly, potentially sustainable in the long run.

However, the project outline did not consider or measure the impact of project interventions on the multiple facets of farmers livelihoods. This is a shortcoming. Although interventions of the project studied had a positive influence on most farmer livelihood assets, another set of project interventions or the same interventions in different socio-economic environments, could equally have had negative effects on these assets. By not measuring these (un)expected impacts, they cannot be timely addressed and can thus endanger the positive effects and sustainability of the project and its objectives. Therefore, it is of major importance that development projects and impact studies should take into account, monitor and assess the impact on all assets of farmer livelihoods. Although all assets should be assessed, the degree of detail will differ between projects whereby a general assessment can be performed with relatively limited resources (see p. 215).

### **10.1.3 Development project interventions worked, but were they really necessary?**

Project interventions made households in project villages integrate themselves in the njansang value chain at a higher pace than their counterfactuals. But, the question arose whether the observed changes would not have happened anyway, even without the project, be it over a longer time frame?

Taking a look at Omgbwang, the most-advanced control village where njansang commercialization has a long tradition, we conclude that Omgbwang's household score better for many livelihood indicators than the households in project villages. All households of Omgbwang are involved in the njansang value chain, incomes have increased and njansang marketing has become an important cash-generating activity. In addition, conflicts about njansang collection and who can harvest which trees are rare and people retain and protect njansang trees in their fields. Isn't this what project interventions strive for? And what is then the added value of project interventions?

We assume that the main advantages of project interventions in the villages of the Nyong-et-Mfoumou department and other rather isolated rural areas, are related to the institutional changes and the new skills and knowledge



### **Box 10.1: Why is the commercialization of njansang so successful?**

Why is njansang such a suitable NTFP for commercialization? And in what does it differ from other NTFPs in the area?

Besides some favourable socio-economic and geographical features of the Nyong-et-Mfoumou department for NTFP commercialization (e.g. it is in the vicinity of a large number of urban centres and markets where NTFPs are traded), there are some particular product characteristics which make njansang well-suited for commercialization. These characteristics are very much in line with what Van Damme and Dirckx (2000) call 'niche commodities'.

Based on the Bayesian Belief Network of Newton et al. (2006) which mentions 66 indicators that help in predicting the impact of NTFP commercialization on farmers' livelihoods, we selected the main indicators which are of specific interest to njansang as compared to other NTFPs.

Favouring product characteristics for njansang are:

- high value per unit weight;
- low perishability;
- long shelf life;
- no strict storage requirements;
- low variation in product quality;
- rather low annual yield variation;
- no direct threats of overharvesting;
- compatible with other common land use systems;
- limited resource management needed;
- resource can be locally abundant;
- low entry barriers;
- traditional processing relies on only a few and common processing tools; and
- increasing market value.

**Box 10.1: Why is the commercialization of njansang so successful? (continued)**

Neutral to negative aspects of njansang are:

- traditional product processing is time-consuming and labour-intensive;
- seasonal availability;
- problems with domestication of *R. heudelotii*;
- not straightforward to increase quantities in the short-term; and
- no current demand for new, diversified product;

Njansang has many favourable characteristics with regard to its commercialization. The specific features of the kernel in combination with the non-destructive harvesting methods, *R. heudelotii*'s pioneer character and the fact that the tree's presence was and still is appreciated in land use systems such as cacao, contribute to the high potential of njansang for commercialization. The weak point is time-consuming and labour-intensive product processing. If this obstacle could be overcome, njansang commercialization would become even more attractive and profitable.

acquired by the farmers. With regard to institutional changes, the creation of a njansang group and organization of group sales would provide njansang producers not only with an increased income but also with a competitive advantage over and compared to villages under similar socio-economic conditions where no project interventions occurred. Moreover, the promoted approach will make the njansang value chain more efficient and profitable for both farmers and traders (cfr. Ferket, 2013). Hence, if properly formed, NTFP groups have the potential to develop into important organizations contributing to poverty alleviation.

The possibility exists that, in the long run, farmers in villages without project interventions will unite and form associations to commercialize njansang similar to those induced by the project. However, chances are small because farmer associations that market food products are rare. We were able to evidence that the skills and knowledge to do so, often lack. Nevertheless, in Omgbwang, households already have been making price-setting agreements at the beginning of the njansang commercialization season for more than a decade. A minimum price was set for the whole village at which they would sell their njansang that year. This shows that new rules are being forged and this might, at best, lead to new customary systems to improve farmers' position in the njansang value chain.

However, we do think that market mechanisms and the creation of new organisations improving farmers' position in the value chain are unlikely to originate in the isolated villages of rural Cameroon without any external incentive, and transfer of knowledge and skills. Moreover, the creation of a system which improves the position of both farmers and traders is very unlikely to appear. Thus, we do see an added value of project interventions in providing knowledge and skills to help and guide farmers to better cope with their daily problems. The main challenge will be to obtain wide dissemination of these skills and commercialization approaches and to reach as much farmers as possible.

A similar rationale pertains to the other skills and knowledge which are provided through project interventions. These skills and knowledge are not readily available in rural areas and can be used by those who acquired them to improve their livelihoods. For example, tree domestication skills can enable farmers to obtain *R. heudelotii* trees with favourable characteristics, producing high quantities of njansang of good quality. Farmers not mastering domestication principles will merely protect wildlings (see chapter 7).

A more ambiguous issue is the promotion of new processing techniques to improve some of the labour-intensive NTFP activities. The provision

of technical know-how to improve harvesting, and product processing is advised by some authors (Marshall et al., 2006b). Nonetheless, new processing techniques are often expensive and beyond the reach of the poorer households, thus, only benefiting the wealthier households and even disadvantaging the poorer farmers (Neumann and Hirsch, 2000). In addition, some studies reveal a pattern of men replacing women due to the introduction of new NTFP processing techniques (Ghatak, 1995). Neumann and Hirsch (2000) did not find in their literature review any study where the introduction of new processing technologies had a positive outcome for women. Keeping in mind that the persons commercializing NTFPs are often economically vulnerable women, we do think that great care should be taken before introducing new technologies. Low-cost technologies will be more accessible to the poor and their introduction is quite straightforward.

With regard to njansang, we refer to the new pulp-removing system for njansang processing (Box 2.2 and 2.2), based on a simple boiling and drying procedure. High-cost technologies, such as the njansang cracking machine, are more difficult to be successfully introduced without disadvantaging the already disadvantaged. Thus, next to a pure economical analysis (Tabougue Nguefac, 2011; Box 2.3), practical, socio-economic issues should be studied as well before any major dissemination of new technology.

#### **10.1.4 The value of participatory approaches**

The present study relied very much on participatory approaches for data collection and this featured on different levels. Ranging from simple questions in semi-structured household questionnaires to focus group discussions and participatory tree inventories. Some of the major conclusions found with regard to participatory approaches will be elucidated hereafter.

Farmers performed a participatory evaluation of the changes induced by njansang commercialization and by project interventions over the 2005-2010 period. During this exercise, changes in different livelihood indicators of interest were assessed through a 'rough' evaluation approach, i.e. through 5-point Likert-items in combination with a weighing exercise to determine the indicators' relative importance. Our results indicated a high correspondence of farmers' impact assessment results with the researchers' appreciation. This indicated the potential of the participatory approach to assess easily and accurately general trends in changing livelihoods. In addition, the approach proved also useful to detect differences in alignment between development organization staff and target farmers. It exposed problem areas and potential areas for future interventions. Thus, participatory approaches were found to be very useful to assess general trends.

However, the approach failed to detect all differences between project and control households. Especially, if trends were heading in the same direction in both project and control villages, our participatory approach was not able to distinguish between different magnitudes of these trends. In chapter 9, we recommend some of the methodological changes that could improve estimating magnitudes of trends observed. Significant differences between similar trends will remain rather difficult to detect applying the participatory approach used in the present study. Thus, if detailed information on an indicator is needed, in particular of magnitudes of trends heading in the same direction, the use of more thorough, rigorous data collection methods is required.

In participatory approaches, respondent bias is often present and difficult to exclude (Menton et al., 2010; White and Phillips, 2012). Our research also demonstrated that project households tended to evaluate some indicator changes more positively than control households. The same absolute changes of njansang income in project and control households were perceived as more positive on a 5-point Likert-item by project households compared to control households. More rigorous, quantitative data collection methods should be used to reduce respondent bias. In addition, regarding qualitative data analysis, clear impact assessment designs and protocols as well as systematic analysis and increasing the sample size could reduce the impact of respondent bias (White and Phillips, 2012).

In addition, our research showed that evaluators related to the project, in our case development organization staff, can introduce a bias towards positive findings. This recurrent problem has been discussed by White and Phillips (2012). Hence, reports relying on expertise of persons closely involved with the project to be evaluated should be critically viewed at and the use of scientifically sound collection methods are very important.

## 10.2 Major implications

The results of this research should be of particular interest to NGOs and policy makers. First, this study contributes to our knowledge about what does and what does not work in rural development. We showed that the promotion of NTFP commercialization can have positive impact on farmers livelihoods. The interventions as implemented by ICRAF, assessing different aspects of farmer livelihoods, have proven to make a significant improvement on farmers livelihood assets. With the aim of poverty alleviation, similar approaches could therefore be supported by both NGOs and policy makers.

Second, the present impact assessment study also indicated problems

and challenges of the project interventions discussed. Among the most important ones are: ensuring that new commercialization approaches (group sales) lead to increased unit prices, ensuring sustainability of the producer group created; keeping involved the poorest, most vulnerable households and enabling them to capture benefits; and ensuring sustainability and development of the *R. heudelotii* kernel supply. Points of caution exposed in our research could be used by ICRAF and other NGOs to improve future interventions.

Third, the present study elucidates methodologies to perform *ex-post* impact analysis. It discusses different participatory approaches and their pros and cons for impact evaluation. It can give NGOs and policy makers ideas on how to approach impact evaluation and which factors to consider when impact studies are performed. The present study exposes strong points and weaknesses of retrospective *ex-post* impact analysis which can be used to improve future impact studies. In addition, it provides a specific approach on how to perform impact studies within the sustainable livelihood framework. It is a straightforward, flexible, participatory approach which evaluates all important assets of farmer livelihoods.

The results of this thesis can also be of use to fellow researchers. Researchers interested in NTFP and their commercialization should find our results to be interest. Our study provides an example of the impact of the promotion of NTFP commercialization on a broad range of farmer livelihood assets, which is quite unique (Marshall et al., 2006b). In addition, our results can be used by conservationists interested in the impact of NTFP commercialization on forests. Our study provides an insight into the spatial impact of njansang commercialization and shows that certain NTFP species with particular characteristics are not necessarily prone to overexploitation and can contribute at the same time to poverty alleviation.

Researchers interested in impact analysis can also learn from our results. We tested different participatory methods and tried to compare for the first time some methodologies which are increasingly being used in impact analysis (e.g. expert scoring on 5-point Likert-items; Kusters et al., 2006; Newton et al., 2006 and DFID, 2011). In addition, we introduced some new approaches to simplify the ever more complex analysis of measuring impact on farmer livelihoods. Our results can fuel the debate on the use of new impact evaluation approaches besides the classic and much criticized randomised control trials (de Janvry et al., 2010; Pasanen, 2013). 'Live' evidence gathered within the context of actual development projects, is indispensable to evaluate the different impact evaluation approaches (Pasanen, 2013). Our study should contribute a piece of evidence in this complicated impact evaluation jigsaw.

## 10.3 Recommendations

### 10.3.1 Further research

Participatory methods in impact assessment should be studied further if they are to become an important part of impact evaluation (Estrella et al., 2000). Advantages and disadvantages, including accuracy and precision, of these methods should be compared.

Differences between data collection methods and their implications should be further studied. In the present study, we found clear differences between njansang quantities measured through weekly records, annual *ex-post* semi-structured questionnaires and tree-based estimates in participatory tree inventories.

With respect to farmers involved in the njansang value chain, new, low-input processing technologies to facilitate the transformation from fruit collection to kernel extraction should be developed, tested and disseminated if appropriate. In addition, market research should provide information about the potential of new products derived from the kernels, such as njansang oil. Public-private partnerships, combined efforts of public, private, and development organizations, could be a way forward to study and expand the market of njansang and its derived products.

Furthermore, *R. heudelotii* domestication should be further developed and encouraged among farmers. Although some things are known about the species domestication, in practice, it is done very rarely. The exact reasons for the farmers low adoption rate of the species' domesticating and the application of vegetative multiplication techniques should be investigated. One of the main problems is the lack of knowledge about the species' germplasm. A database of the species genetic variety and distribution, as well as individual tree characteristics and descriptors should be made. Based on this information trees with desired characteristics can be easily selected for further domestication purposes. Hence, more research is needed. The whole domestication process will enable farmers to (1) work more efficiently, e.g. having to walk less distance for fruit collection; (2) increase the quantity and quality of njansang collected and commercialized; and (3) alleviate *R. heudelotii* populations and the ecosystem in the surrounding forests in general.

### 10.3.2 Research-development organizations

More studies are needed on the impact of development projects on farmers' livelihoods. If different development projects could be evaluated using the

same overall framework, much could be learned about what works and what doesn't in development. A first step in the good direction would be if each NGO adopts a fixed framework to evaluate the impact on people's livelihoods of each of their development projects (e.g. Donovan and Stoian, 2012). Significantly more progress would be made if a similar framework would be used across organizations. In addition, scientifically sound, objective results, both negative and positive, should be made widely available.

One of the well-established holistic frameworks available and already widely used, is sustainable livelihoods framework (DFID, 1999). We recommend to apply the SLF for impact evaluations on people's livelihoods and make use of the five assets approach (natural, financial, physical, human and social) to structure and distinguish amongst the variable impacts (Donovan and Stoian, 2012). Within and between development organizations could be decided which general indicators, and methodologies to measure them, would be measured in every project (e.g. household income). In addition, project-specific indicators could be added for each project. This means that development projects should take into account, monitor and assess all five groups of livelihood assets. Hereby, negative outcomes can be detected, prevented and mitigated when necessary. Similar approaches have been suggested by other authors and even put into practical tools (Donovan and Stoian, 2012). Nevertheless, the practical implementation and dissemination of these approaches and tools remains poor.

One of the reasons that these multi-dimensional impact assessment tools are not widely disseminated, is their complexity and the high costs which are, or are assumed to be, related to them. Hailey and James (2003) state that *'it is essential to create simple, participative frameworks that use different processes to examine the dynamic and multi-dimensional character of what they are trying to measure'*. In the present study we provide such a framework.

Another recommendation for development organizations is to be aware of the bias which can be introduced by development staff evaluating their projects applying qualitative or participatory approaches. The present study confirmed this problem which has been mentioned already by other authors (e.g. White and Phillips, 2012). The main recommendation is to use scientifically sound data collection methods which focus on the objectivity of the data collected.



# Appendices



# Appendix A

## A new participatory approach to measure impact

Based on the insights acquired during the present study, an approach was developed to measure impacts on people's livelihoods. We created a quick, flexible method which is especially suited to measure impacts of development projects on people's livelihoods. The method provides a quick overall assessment of all five livelihood assets (natural, financial, physical, human and social; DFID, 1999) while it allows for the possibility to more thoroughly assess certain indicators. It builds on a difference-in-difference design, comparing project with control groups. Recent advances in and guidelines of impact assessment should be taken into account (de Janvry et al., 2010; Ashley and Hussein, 2000; Maredia, 2009). Especially sufficient attention and resources should be allocated to the selection of matched counterfactuals which is indispensable to obtain representative results (de Janvry et al., 2010; Maredia, 2009).

Our starting point is a rural development project which has been approved for implementation but did as yet not feature practical field interventions. Both project and control groups have been selected according to the guidelines of de Janvry et al. (2010); Maredia (2009) and Andam et al. (2008, 2010).

## Step 1: **Determine measures of success**

In the first stage, indicators to measure the outcomes of development interventions have to be determined. It is advised to rely on the sustainable livelihood framework (SLF) for indicator selection (DFID, 1999). By selecting indicators for each of the five assets as distinguished by the SLF (social, financial, human, natural and physical), most important aspects of farmer livelihoods will be covered.

Working protocol:

- **1a:** Development organization staff formulates indicators measuring success, and the outcomes of the development project based on: 1) the project's objectives; 2) the larger framework of farmer livelihoods and their vulnerability context; and 3) literature.
- **1b:** Indicators are also determined by the targeted farmers. Participatory methods can be used for this purpose.
- **2:** The importance of each indicator is to be determined using a simple weighing exercise as discussed in the present study (chapter 9; Termote et al., 2010, 2011). Both development organization staff and farmers should do this exercise.

During the determination of indicators, both farmers and development organization staff, should make a difference between core indicators and additional indicators. Core indicators, are indicators which are essential for the project and its stakeholders and will be assessed thoroughly. Additional indicators are indicators which will be assessed with less detail. Identification of core indicators can be easily done during, and based on, the indicators' weighing exercise.

- **3:** Methods on how to measure (core) indicators should be chosen. It is advised to involve farmers in this process.

**End-result of the first step:** *a set of indicators that can be monitored to measure the outcomes and successes of the development project. Each indicator has also a specific weight which is related to its importance as defined by farmers and development organization staff. Indicators can be measured on household and/or community level depending upon the project's objectives. A set of core indicators is distinguished based on the input of all stakeholders.*

**Box A.1: Calculating indicator weights**

Following the work protocol as described above, different stakeholders involved (in our case development organization staff and targeted farmers) assign weights to the different indicators according to their importance. Hence, to simplify further analysis, one single weight could be calculated for each indicator. This could be done by taking the average of the weights assigned by the different stakeholders, and this for each indicator. Although this simplifies further analysis it should be done only if the weights given by the different stakeholders have similar values. If this is not the case, taking average values will disguise differences between stakeholders which could hold valuable information. However, because most current development projects have a bottom-up approach, which should imply that development organization staff and targeted farmers objectives are quite aligned, indicators' weight will probably be very similar (see chapter 9)

**Box A.2: Number of core indicators**

Depending upon the objectives, available resources and detail required, the number of indicators and core indicators will vary. Especially the number of core indicators will have a large influence on time and resource investment from the development organization's perspective. Core indicators are to be assessed thoroughly relying on methods such as: inventories, semi-structured questionnaires or dairies. Hence, it is advised to limit the number of core indicators to a minimum.

## Step 2: **Baseline study**

During the baseline study, data on indicators are collected in project and control groups. These data will be used for comparison at the end of the project cycle.

- Core indicators are measured applying methods which provide objective, statistically sound and representative data (e.g. household surveys, field measurements, 24h recall, dairies, ...).
- The 'current status' of all indicators (both core and additional) is assessed using 5-point Likert-items (see box below). This can be done either by households separately or through focus group discussions (depending on objectives, resources and detail of data needed). Data of communities can be collected through focus group discussions. Data on households are advised to be collected at household level. However, to limit resource input, the use of focus group discussions to collect data on household indicators could be investigated in a preliminary study.

## Step 3: **Monitoring**

Monitoring indicator change can aid stakeholders to keep on track and adjust course if necessary in order to obtain the predefined objectives. Monitoring can easily be done by evaluating indicators' changes on 5-point Likert-items. Furthermore, there should be room for the inclusion of new indicator which were overlooked during the selection of indicators in Step 1.

In addition, indicator changes could be evaluated as: 1) their change since the beginning of the project; or 2) their change 'since the last measurement' and thus over a certain (fixed) period. Both approaches have their advantages and disadvantages. While measuring change since the beginning of the project will provide a better idea on overall progress, measuring change over a shorter period will better evidence recent changes.

During monitoring, core indicators could additionally be assessed in the same way as they were during the baseline study (depending on objectives, available resources, detail required, time frame, etc.).

## Step 4: ***Ex-post* study**

The *ex-post* study takes place after project interventions have finished. It can be performed just after the end of the project cycle and/or years later to study long-term impacts.

### **Box A.3: 5-point Likert-items**

To analyse the 'current state' of indicators in the baseline study and at the end of the project, the values on the 5-point Likert-items could be: -2) very bad; -1) bad; 0) intermediate; 1) good; and 2) very good.

To analyse indicator change, the values on the 5-point Likert-items could be: -2) very negative; -1) negative; 0) no change; 1) positive; and 2) very positive.

Likert-items could be 'quantified' by attributing quantitative values to the different points on the items. This can reduce bias between project and control groups but will increase complexity. Farmers should be involved when setting values for the different indicators (Cosyns et al., 2011; Estrella et al., 2000). However, not all indicators can be linked to quantitative values.

Likert-items could be made 'continue' by allowing values to be given along a continuous line between the different points on the Likert-item. This approach will increase the amount of possible answers, could potentially capture small changes and could be useful to evaluate indicators over time.

- Core indicators are assessed as they were during the baseline study.
- The current status of all indicators (both core and additional) are assessed again using 5-point Likert-items. In addition, there could be made a assessment of change over the investigated period. This could also be done using 5-point Likert-items.

### **Strengths of this participatory impact assessment approach**

The proposed approach has a simple outline which can be turned into a powerful tool to collect high-quality detailed data while maintaining compatible and comparable with other studies.

Its main strengths are:

- general applicability: can be applied for very small to very large projects;

- large flexibility due to the free choice of core indicators, which enables large control over depth of data collection and resource investment;
- increases involvement of farmers and probably also project acceptance;
- combines quick and simple with thorough and detailed data assessment;
- the use of the SLF which enables the results obtained to be compared with those of other studies using the SLF; and
- upgraded (continuous, quantified) 5-point Likert-items can still be compared to classic 5-point Likert-items.



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